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Disturbances of Motility

Robert A. Kidd, Jr., M. D.

Voluntary motion is a complex function which is controlled by many areas of the central nervous system. It is exteriorized through the pyramidal (corticospinal) tract, or upper motor neurons, and through the anterior horn cells and their axones, or the lower motor neurons. In addition, however, for its useful functioning it requires to be coordinated, a function which is controlled by the cerebellum. Control and maintenance of posture and of tonus are also necessary and these are made possible through the integrity of vestibular reflexes, striatal pathways and of impulses which are exteriorized through the rubrospinal and reticulospinal tracts. Ordinarily in dealing with impairment of motor function one speaks of paralysis of muscles, and yet this term usually is misapplied. In upper motor neuron lesions, for example, there is a paralysis of voluntary movement but by no means a paralysis of muscles, the reflex excitability of which may be increased.

It has been said that the exteriorization of voluntary movement is brought about through the action of two neurons, the upper motor neuron and the lower motor neuron. Because of this there are two types of lesions, the physical manifestations of which are:

	Upper Motor Neuron Lesion	Lower Lesion
1. Nutrition	Preserved, no atrophy except that of disuse	Impaired, atrophy
2. Power	Diminished or lost	Diminished or lost
3. Tonus	Increased	Diminished
4. Clonus	Present	Absent
5. Tendon reflexes	Increased	Diminished or lost
6. Superficial reflex	Abolished	Abolished
7. Pathological reflex	Present	Absent
8. Faradic excitability	Preserved	Diminished or absent

In muscles which are undergoing atrophy due to lesions of the anterior horn cells and which are not yet fully paralyzed, fibrillary movements are frequently and characteristically observed. The increase in tonicity, or resistance to purely passive movements, in upper motor neuron lesions is usually more marked in the flexor groups of muscles. Frequently at the onset of hemiplegia resulting from a lesion of the pyramidal tract, tonicity will be diminished in the parts involved and the tendon reflexes will be absent, but usually within forty-eight hours this state will begin to pass into that characteristic of a pyramidal tract lesion. The cause of the diminution in tone and absence of tendon reflexes in such a case is the widespread and sudden shock to which the entire central nervous system is subjected.

The anatomical diagnosis in cases of disturbance of motility depends not only on the determination of what pathway is involved but also where in its course it is involved. The pyramidal tract arises from the large pyramidal (Betz) cells in the pre-Rolandic area. The axones of these cells converge as they pass downward between the basal ganglia, where they form the internal capsule,

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and then descend into the medulla as compact and circumscribed bundles. As it passes through the midbrain, pons and medulla, this tract gives off its cranial nerve components which cross to the cranial nerve nuclei of the opposite side. When the tract reaches the lower medulla it crosses almost completely and descends in the opposite side of the spinal cord. Those fibers which do not cross but descend the homolateral side of the cord do not concern us in a discussion of this kind. Having reached the segment of the cord which supplies the part to which they are supplying the function, the fibers synapse with the anterior horn cells or cells of the lower motor neurons. The axones of the latter, as was noted above, are subjected to influences from several pathways and then submit the impulse to the periphery. It is apparent, therefore, that the pyramidal tract arising from one hemisphere of the brain carries impulses to the opposite side of the body, whereas the lower motor neurons arise from the same side of the cord as that of the body to which they are distributed. Furthermore the lower motor neuron is strictly a segmental structure, whereas the pyramidal tract is not. In the motor cortex those which are to supply the leg arise uppermost, those for the arm and trunk are in the middle, and those for the face, tongue and jaw are at the lower end of the pre-Rolandic convolution.

DISEASES DUE TO PRENATAL INFLUENCES (DYSPLASIA)

Defects in growth may occur at any time during the development of the nervous system. If this happens early or if the structural defect is a severe one, it may be incompatible with life or result in the formation of a monster. The defect may consist of absences of parts, even of the cerebral hemispheres (anencephaly) or spinal cord (amyelia). The failure of development may be more restricted to a single structure or unit, such as the corpus calosum, certain cranial nerve nuclei, or motor or sensory pathways. A part, even though present, may fail to attain its proper growth. The brain may be small (microcephaly) and enclosed in a small skull. The deficient growth may be limited to one-half or to the gyri of the cerebral hemispheres (microgyria). It has been found that with microgyria in one cerebral hemisphere there usually is also imperfect growth in other regions of the nervous system, such as the opposite cerebellar hemisphere. Failure of development of parts, based upon their position in the phylogenetical scale, has been described, and Brouwer has reported atrophy of the neocerebellum and of the neo-olives, with preservation of the phylogenetically older parts of both.

The reverse condition is shown in macrogyria, in which the brain is considerably larger than normal. Another abnormally excessive type of growth is reduplication of the lower part of the spinal cord in which an apparently normal cord lies side by side with a smaller replica. Heterotopia is a condition in which certain structures or cellular groups normally present in gray matter are displaced into white matter.

With these various defects in growth, the symptomology may vary greatly. In some cases a live birth is impossible. In others monsters are born who live but a short time. On the other hand, it is surprising what developmental defects may occur with little or no symptomology, much less in fact than if a comparable condition had been produced by disease. Mentality frequently is retarded in these conditions and epileptic attacks are common symptoms. The diagnosis depends upon the history of the case and also upon the appearance of the patient if this is at all characteristic. These conditions, being developmental defects, are not amenable to treatment, but if the resulting disability is slight, it is possible, by training and education, to bring about improvement in the individual's capacity.

NEUROLOGICAL EXAMINATION AND INTERPRETATION OF SIGNS AND SYMPTOMS

Gait:

The gait may be spastic, stiff, with the legs extended, the feet shuffling. It may be hemiplegic, that is, the lower extremity is held stiff and circumducted in walking. In bilaterally spastic limbs, as in cerebral diplegia or ordinary paraplegia, there is a crossed progression or scissors gait. The patient may take very short steps (cerebral arteriosclerosis, striatal rigidity). The gait may be unsteady, the steps irregular, jerky, ataxic, the legs being flung aimlessly or lifted unduly high from the ground. The patient watches his step in tabetic ataxia. He may be very unsteady, "drunken," in cerebellar ataxia, in which case there is a disassociation between the movements of the body and the legs, the former either lagging behind or being precipitately thrust forward. The gait may be gro-

tesque, histrionic, or dancing in Huntington's chorea. It may be waddling in the case of weakness of the hip muscles, as in the dystrophies or spinal muscular atrophies. In the case of weakness or paralysis of the peroneal group of muscles the patient cannot stand on his heels, and he must raise the legs high in walking, the gait being known as steppage. If the soleus and gastrocnemius are paralyzed, the patient cannot rise on his toes. The hysteric gait is bizarre; sometimes, despite absence of paralysis, the hysteric patient can neither stand or walk; or he may make a number of superfluous movements, crumple together, and fall to the ground (without hurting himself).

At times (paralysis agitans), the patient sways, rooted to the ground before he starts to walk, then runs (festination) rapidly forward with short steps (propulsion) and sometimes falls if he is not stopped. Similarly he may run rapidly backward (retropulsion) as if drawn by an uncontrollable force, or sidewise (lateropulsion). In the case of hemiplegia, walking sidewise is easier to the paralyzed than the healthy side. Walking backwards is much easier in paresis or paralysis of the quadriceps extensor than walking forward.

Normally, there is associated swinging of the arms in walking. These movements are quite automatic. Occasionally (paralysis agitans syndrome), they are lost, either unilaterally or bilaterally. The patient walks rigidly, the trunk, head and limbs constituting one piece as it were. He is stooped forward; there is no expression to his gait. He sits down or rises stiffly, the arms hanging fixedly by his side, the head held rigid. Immobility of the neck may be due to cervical spondylitis or myositis, fracture of the cervical spine, tumors of the spinal cord, Pott's disease, and others.

Coordination:

While the patient is still on his feet, equilibratory coordination is tested by means of the Romberg sign. An ataxic person generally stands on a broad base. Standing with feet together, eyes first open, then closed, swaying is noticed. If this increases or is brought out by shutting the eyes, the Romberg sign is present. The same thing may be tested by the patient standing first on one leg and then on the other. The Romberg sign must be properly evaluated and the swaying differentiated from the jerking of the hysteric, who, when observed, immediately flops in all directions but never falls. The reason for having the eyes open and closed in testing for the Romberg sign or any other manifestation of incoordination is that we can hereby differentiate between cerebellar and so-called cerebral or sensory ataxia. In the former the ataxia is not influenced by closing the eyes; in the latter (the sensory impulses going up the posterior columns and mesial fillet to the thalamus and postcentral cortex), shutting out visual afferent impulses going to the brain aggravates or brings out the ataxia.

Non-equilibratory ataxia is illicited by having the patient touch alternately, slowly and rapidly, the tip of his nose with the tip of one of his fingers. An ataxic tremor also may become evident. Touching one's index finger with the other in front of the body, buttoning one's coat, and touching alternately all the fingers with the thumb, will bring out further ataxia. At the same time, dysmetria (inability to measure distance) may be demonstrated, although this can be elicited by asking the patient to raise his arms and bring them quickly to a horizontal top. When dysmetria is present one or the other arm drops below the level, requiring correction. Both ataxia and dysmetria may be brought out by asking the patient to lift a glass of water to his lips. In cerebellar ataxia one frequently observes decomposition of movement (Babinski); that is, instead of carrying out one well-timed movement with a limb, there is irregularity in the successive flexion or extension at the various joints. Dyssynergia may also be demonstrated by having the patient perform rapidly antagonistic movements, such as pronation or supination.

Skilled Acts:

A number of skilled acts already have been tested incidentally in the course of the coordination tests. Touching alternately the fingers with the thumb, picking up a pin, playing an instrument, writing, and speaking are skilled acts, the last being the most complex of all. Skilled acts may be interfered with by actual impairment of the musculature and its peripheral innervation (sensory or motor), by involvements of the upper motor neurons, by cerebellar incoordination, and, finally, by impairment of the higher, cortical, associative, or cognitive (gnostic) functions. A movement, then, may be performed badly or not at all because the peripheral apparatus, the tool, so to speak, is affected or because the motion concept or formula is impaired. By common consent apraxia is used to designate

that loss of skilled movement in which conceptual movement formula alone is lost, while motor apparatus for performing the act is intact. We speak of apraxia (total loss), dyspraxia (partial impairment) and eupraxia (normal). Similarly with speech disturbances the difficulty may be in articulation (that is, if the speech musculature or its innervation is impaired), or in the formulation of speech concepts. Complete loss of articulatory speech is known as anarthria while partial impairment is spoken of as dysarthria. In aphasia, there are disturbances of speech (hearing, reading, writing, speaking, gestures, etc.) in the presence of an intact peripheral speech apparatus both on the perceptive and expressive side.

To test articulatory speech the patient is engaged in ordinary conversation. One notes slowing, tremulousness, scanning, explosiveness, slurring of letters, syllables, words, and stammering. The scanning, stacatto speech which is observed in multiple sclerosis, the quivering explosive articulation betraying a cerebellar component, the trembling, slurring speech of general paresis, the slow speech of striatal rigidities, the paralytic, nasal speech of bulbar paralysis, the explosive barely-understood speech of "pseudobulbar" palsy can frequently be brought out either in conversation or by means of test phrases. The latter are especially employed when general paresis is suspected.

Abnormal Involuntary or Spontaneous Movements:

Tremor is the most common of all abnormal movements. When present one notes its location (the head, eyelids, lips, the jaw, tongue, arms or legs), rate, amplitude and rhythm. The tremor may be designated as slow, moderate or rapid; coarse, medium or fine, and regular or irregular. The tremor may occur when the patient is at rest (frequently, but not always, in paralysis agitans); it usually is increased by emotional excitement and generally disappears during sleep. One also speaks of motofacient (when it is found in the muscles participating in action) and the non-motofacient tremor. That which occurs in fatique states or neurotic persons generally is coarse, while the "functional" tremor seen in exophthalmic goiter is rapid and fine, especially noted in the fingers of the outstretched hands. There is the lip and the tongue tremor of the alcoholic, in addition to the tremor of the hands; the perioral tremor of the paretic, and the psychogenic tremor (lid). Other toxic tremors are seen in various states of chronic poisoning (mercury, lead, tobacco). The senile head tremor (also of the jaws and lips) simulates the tremor of paralysis agitans but generally is unaccompanied by rigidity. Finally, there is an involuntary rhythmic head-rolling occasionally observed in rickety children below the age of two years. Spasmus nutans, seen in babies between the age of six and twelve months, consists of rhythmic nodding or rotary tremor of the head and is frequently accompanied by nystagmus. Closing of the eyes stops the tremor, while forcible control of the tremor increases the nystagmus.

Fibrillations are generally slow, vermicular twitchings of individual muscle-fibers or bundles. They may occur anywhere: face, tongue and palate, body and limbs. These twitchings do not produce movements of muscles or joints, nor does myokymia, which is a transient quiver of a muscle, observed in weak, anemic persons. Fibrillations are essentially significant of slow degeneration of anterior horn cells; that is, nuclear masses or motor cells. They are said to occur rarely in degenerative peripheral nerve lesions, especially of the hypoglossal nerve. Twitchings occasionally may be observed in muscles whose motor nerves are regenerating, especially of the facial muscle. Fibrillations are noticed mainly in progressive spinal muscular atrophies, amyotrophic lateral sclerosis, syringomyelia, and progressive bulbar palsies. One must differentiate between the live flesh, or the muscular twitchings due to cold, and fibrillations; the former are more or less universal, the latter limited to a group of muscles.

Choreic movements are fairly rapid, objectively purposeless, irregular, spontaneous, and occur anywhere in the limbs, face or body. They may be limited to a limb or one side of the body (hemichorea). The patient cannot walk slowly, the gait often being dancing, clownish, bizarre, as in Huntington's chorea. While the movements seemingly have a pattern but no purpose, they do not repeat themselves with stereotyped regularity as in spasms or tics. The choreic movements may occur in the tongue, the patient being unable to hold it protruded for any length of time. In the face, choreic movements are grimacing in character. Occasionally one observes chorea of the diaphragm which manifests itself in irregular spasmodic breathing or respiratory grunts and may possibly be demonstrated fluoroscopically. Very rarely one notes chorea of the eyeballs. There is a certain dyssyner-

gic, cerebellar hypotonic element to chorea and a dissociation in the reciprocal innervation between agonists and antagonists.

Athetoses are slow, irregular, objectively purposeless movements, not without an apparent pattern. They are observed mainly in the fingers and toes, in the form of flexion and extension and spreading of the digits. The movements are practically constant and not infrequently accompanied by synkinesias; that is, associated movements in other parts of the body, limbs and face. Athetosis must be distinguished from pseudo-athetosis (tabes, combined sclerosis) which is seen mainly in the fingers of persons whose sense of position (posterior columns) is impaired. These are not spontaneous but elicited when the patient closes his eyes and stretches out his hands.

Spasms of muscles or groups of muscles are slow, sometimes prolonged pattern movements which may occur anywhere in the body. Some are known as habit-spasms. They are not infrequently psychogenic (hysteric conversion symptoms) in nature. They often occur in the face (hemifacial), sometimes in the eyelids (blepharospasms), occasionally in the neck (torticollis) and in the shoulders.

Dystonic movements are large, slow, amplified athetoid movements involving the limbs and the body. They, too, are not purposive, though there is a seeming pattern. There is a twisting and turning of the body, the typical torsion spasm, especially of the pelvis and often of the neck muscles. The movements are constant and irregular. Between the waves of movement, so to speak, there is a bizarre posturing of the body and the limbs. After a time contractures of the muscles, especially of the feet, and torsion of the pelvis become permanent features, in addition to the movements. Myoclonus is a sudden regular or irregular contraction of a muscle which usually does not produce movement. It appears as if the muscle responded to a faradic shock. These spasmodic contractions usually are observed in the limbs but may be seen in the body and face. Hiccup is essentially a spasmodic myoclonus of the diaphragm. Aside from the fact that localized myoclonus may occur as a symptom or sequel of encephalitis (especially the abdominal muscles) it may be very widespread, as in paramyclonus multiplex) of Freidreich and may occur in association with the convulsive state in the condition known as Unverricht's myoclonus epilepsy.

Finally, one may observe the generalized tonic and clonic muscle spasms classed under convulsions. All those spasms are accompanied by rigidity. The true epileptic convulsions are accompanied by unconsciousness. At first they are fairly regular, tonic, in which the whole body is rigid, later they become intermittent and clonic. The localized (Jacksonian spasm), limited to the face or one limb or half of the body, is not as a rule attended by unconsciousness, although this may ultimately supervene, and pareses of the muscles which were the seat of the localized fits remain as temporary or permanent sequels.

Reflexes:

Occasionally in upper motor neuron (pyramidal tract) disease, which is accompanied by hyperactive deep reflexes, they cannot be elicited because the limb is too spastic and held rigid either in flexion or extension. A percussion hammer (sometimes the finger) is used for obtaining the deep reflexes and a dull pin or toothpick for the superficial.

Deep Reflexes:

The Jaw Jerk. — The patient opens his mouth so that the lower jaw hangs a little. A wooden tongue depressor is placed on the molars and struck a sharp blow. Palpable or visible contraction of the masseter and raising of the jaw result. Another way of eliciting the reflex is by placing the thumb on the side of the lower jaw and striking it with the hammer. The jaw jerk is mediated through the trigeminal nerve and the reflex center is in the pons.

The Pectoral.—The arm is placed halfway between the adduction and abduction and the finger on the muscle tendon near the humerus. A sharp blow on the finger elicits adduction and slight internal rotation. The reflex arc is by way of the anterior thoracic nerves and the fifth cervical to the first dorsal segments of the cord.

The Biceps.—The forearm is placed halfway between the flexion and extension and slightly pronated (the biceps being also a supinator) and the thumb and finger on the tendon. A blow on the digit results in the flexion of the forearm. The reflex arc is by way of musculocutaneous nerve and the fifth and sixth cervical segments of the cord.

The Triceps.—The forearm is held by the examiner, partly flexed at the elbow, and the tendon struck just above the olecranon process. Extension of the forearm results. Reflex arc: radial (musculospiral) nerve and the sixth and seventh cervical segments.

The Radial.—This is a periosteal and not a tendon reflex. With the elbow partly flexed the hand is placed halfway between pronation and supination and the styloid process of the radius tapped. The result is some supination and flexion at the elbow (the brachioradialis being a flexor). Occasionally there is also flexion of the wrist and fingers.

The Ulnar.—This, too, is a periosteal reflex. The hand is held in a position similar to that for eliciting the radial jerk and the styloid process of the ulna tapped. The result is pronation and adduction of the hand. Reflex arc: ulnar nerve and eighth cervical and first dorsal segments.

The Patellar or Knee Jerk. — The leg is flexed at the knee joint to about 120 degrees. The quadriceps tendon is tapped just below the patella. Result: extension at the knee, visible and palpable contraction of the quadriceps and occasionally homolateral or crossed adduction of the thigh. The last is known as patello-adductor reflex. Reflex arc: femoral (anterior crural) nerve and the second, third and fourth lumbar segments. Loss of the knee jerk is known as Westphal's sign.

The Achilles or Ankle Jerk.—This is best obtained by having the patient kneel on a padded chair, but it can be obtained in any other way provided the foot is held at a right angle and under not too great tension either in flexion or extension. Tapping the tendo achillis results in contraction of the soleus and gastrocnemius and plantar flexion at the ankle. Reflex arc: tibial nerve (internal popliteal) and first and second sacral segments.

Clonus:

Ankle clonus.—The leg is held in one hand and the foot grasped in the other. The foot is briskly dorsiflexed one or more times and a clonic repetition of the normal ankle jerk in the form of a rhythmic tremor results. If only a few jerks result, the clonus is exhaustible; if the jerking keeps up as long as the foot is dorsiflexed it is inexhaustible. While ankle clonus is generally a sign of pyramidal tract disease, it may be elicited in persons whose reflexes are normally very active, especially in neurotics; that is, in hysteria. Plantar flexion of the foot will abolish organic clonus and leave the hysterical unaffected. Patellar clonus is obtained by extending the leg, grasping the patella between the thumb and forefinger, and briskly pushing it down one or more times. The result is rhythmic jerking up and down of the patella. Jaw and wrist clonus are comparatively rare.

Pathologic Reflexes:

The Babinski toe sign is found in lesions of the pyramidal tract and is obtained by stroking upward and inward the outer side of the sole of the foot. If positive, there is fanning, plantar flexion of the lesser toes, and dorsiflexion of the big toe. Sometimes in severe lesions there is simultaneous flexion at the ankle, knee and hip and contraction of the tensor fascia femoris. It is a question whether the Babinski sign is a pathologic exaggeration of the general flexion reflex; namely, a defense reflex. It is quite possible that it is a release phenomenon; that is, when the pyramidal tract is impaired, the extrapyramidal influence causes dorsal extension of the toe. Utilizing the mechanism of the tonic neck reflexes Walshe showed that the Babinski sign could be accentuated if the head is rotated with the occiput to the paralyzed side and inhibited if it is turned the other way. The same dorsal extension of the toe in pyramidal tract disease may be obtained by the Oppenheim maneuver (stroking downward the median side of the tibia), Gordon (compression of the calf muscle), Chaddock (stroking around the external malleolus) and Schaefer (pinching of the tendo achillis). The Rossolimo sign consists of plantar flexion of the toes on tapping the balls of the toes. This sign is most useful in disease of the pyramidal tract when there is by chance paralysis of the extensors of the big toe. It should be added that there may be a pseudo-Babinski in poliomyelitis when all the muscles of the foot except the dorsiflexors of the big toe are paralyzed and stroking causes extension of the toe because it is the only digit which can respond at all. The Babinski sign can be elicited at times in narcosism, in general coma, and in postconvulsive states.

The Clinical Significance of the Reflexes:

Normally all superficial and deep reflexes can be elicited and are equal on both sides. If the reflexes are naturally sluggish or naturally lively (especially in neurotics) the deep and superficial reflexes are equally sluggish or equally lively. Both the deep and superficial reflexes become significant of some pathologic disturbance if they are unequal on the two sides or if there is a discrepancy between the deep and the superficials. If pathologic reflexes (Babinski toe sign) can be demonstrated in addition, then a definite lesion may be inferred but not the nature of it. It is assumed that a lesion of the pyramidal tract releases the lower centers from normal inhi-

bition, permitting active reflex responses to stimulation.

In upper motor neuron or pyramidal tract lesions the deep reflexes are increased and the superficial reflexes diminished or abolished on the same side. As the lesion may be anywhere along the corticospinal pathway from the cortical Betz cells down to the level where the pyramidal fibers go to the anterior horn cells, increased deep reflex and absent abdominals need have no localizing value. Occasionally, however, they have. Thus, if the upper deep reflexes are normal and the lower very active, we may localize the lesion in dorsal region of the spinal cord, and if by chance the upper abdominal reflexes are present and the lower absent we may as definitely localize the process at the ninth and tenth dorsal segments. Physiologically, the abdominal reflexes are spinal segmental reflexes of the flexor type, augmented by cortical activity and inhibited by extrapyramidal centers; therefore, they are diminished in lesions of the corticospinal pathways and increased in basal ganglion disease.

Loss of deep reflexes occurs in lesions of the lower motor neurons and of the afferent side of the lowest reflex arc. Therefore, they are lost in lesions of the peripheral sensory nerves, in disease of the roots, affections of the anterior horn cells and lesions of the peripheral motor nerves. Deep reflexes also may be lost in actual destruction or complete atrophy of the muscles. As the loss of reflexes generally is due to lesions of definite nerves or spinal cord segments, it has accurate localizing value. But the deep reflexes may be abolished also in disease of the posterior columns of the cord. In that case they have no definite localizing value, excepting when those of the upper extremities are preserved, in which case we infer that the site of the lesion is between the upper dorsal and upper lumbar segments. Loss of deep reflexes occasionally occurs in tumors of the posterior fossa probably as a result of pressure by the cerebrospinal fluid on the posterior roots of the cord. If there is local anesthesia of a part the superficial reflexes are abolished, not because of any central lesion but because the afferent impulse cannot be conveyed to the spinal cord. Loss of abdominals may occur in acute abdominal conditions, the loss sometimes corresponding to the quadrant involved. Increased tonus or rigidity generally accompanies active deep reflexes and diminished tonus or flaccidity accompanies loss of deep reflexes.

Chang Chung-ching . . . is the greatest physician that China has ever produced. He is often spoken of as the Chinese Hippocrates and is venerated as the Sage of Medicine. . . . Very little is known of his life except that during the reign of Ling Ti, 168 A.D., he graduated as doctor of literature, and about 196 A.D. held office as mayor of Changsha for some time. . . .

Chang Chung-ching is especially known to posterity by his *Shang Han Lun* or *Essay on Typhoid*, which is one of the most important medical classics, ranking with Huang Ti's *Nei Ching* or *Internal Classic* in importance. This work does not, as the name implies, deal with typhoid only, but with other fevers as well. It consists of ten volumes and was edited by Wang Shu-ho, the great authority on the pulse, who flourished about the Chin dynasty (280 A.D.). . . . This *Essay on Typhoid* is usually considered as the medical "Four Books," Huang Ti's *Nei Ching* being the "Five Classics." So popular has it become that, according to the Medical Bibliography 115 commentaries, concordances or editions of this work have already been published and more are being turned out every year.

The best edition in existence is that by Cheng Wu-i of the Chin dynasty. It is composed of 14 volumes, ten of which consist of the original text by Wang Shu-ho, the remaining four being by Cheng himself. . . . The antipyretic treatment of fever by drugs, as well as by cold water, was described. To sweat, or not to sweat, was considered such an important question that a special chapter was devoted to this point, numerous indications for and against inducing sweating being given.

Chang Chung-ching was perhaps the first to employ enemas to evacuate the bowels. He writes, "do not give drastic purgatives for the constipation of typhoid, for the internal secretion has dried up. An enema of pig's bile or the juice of thladiantha dubia should be administered."—*From "History of Chinese Medicine" by Wong and Wu.*

Common Traumatic Nerve Injuries of the Arm

(*In Three Parts*)

Part I

Gordon MacKay Morrison, M. D., F. A. C. S.

SHOULDER

In *dislocated shoulder* one should always obtain X-rays before and after reduction, since, in not a few instances, the greater tuberosity of the humerus has been broken off. In such a case if Kocher's maneuver of traction and external rotation is used, the tuberosity may be separated a considerable distance from its original location. A number of these cases show nerve injuries in the region of the shoulder with atrophy of sections of the deltoid and in some instances considerable pain.

Competent physical therapy of heat, massage and corrective exercises as soon as healing permits, will prevent that serious atrophy and contracture of antagonists which takes so many months to be brought back to normal.

Fracture of the surgical neck of the humerus causes in certain individuals the same general sequence of symptoms that follow dislocation, the distribution of nerve lesion being different in some patients from those with dislocations.

Crutch palsy or radial nerve paralysis with wrist drop is seen in those who take their entire weight in the axilla rather than on the handles of the crutches. This disability may last from two to six weeks but recovery is certainly hastened by keeping the parts better nourished through treatment by a good physical therapist.

Supraspinatus tear or atrophy as well as atrophy of the deltoid muscle may occur in the conditions already mentioned.

Bursitis from immobilization may be and frequently is an aftermath of injury to the shoulder.

Coming to the *midshaft humerus fracture* with radial nerve involvement, one sees the following: (1) fracture and edema, (2) fracture and direct contusion, (3) fracture with pinching callus, (4) fracture with tearing of the nerve and (5) pressure hematoma causing Volkmann's ischemic paralysis unless circulation is promptly restored by fasciotomy.

In the first class, that of fracture with edema, the radial nerve palsy, when present, usually disappears in a few days.

In the second class, that of direct contusion against the humerus, the length of time for recovery may be considerably longer.

In the third group, about which it is still controversial as to whether or not to operate, I personally favor operation and transplantation of the nerve rather than allow it to be pinched by callus and possibly destroyed. There are, however, some experienced men who feel differently. When the callus pinching of the nerve develops, the first symptom noted is numbness of the back of the thumb and inability to abduct that member. This occurs between the fifteenth and seventeenth days.

In the fourth class, fracture with tearing of the nerve, immediate suture should be done and if, because of the condition of the skin or other reasons, the nerve may not be sutured immediately, it should be done within one to two weeks of the time of the accident. A very long convalescence of nine months to a year or even up to fourteen or fifteen months may be expected before return of function. The last radial nerve motor power unit which will come back will be abduction of the thumb.

The fifth class mentioned, that of pressure hematoma, is distinctly rare and the writer has had two such cases—one published in the JOURNAL OF BONE AND JOINT SURGERY, July 1935.

Operative treatment is not indicated in loss of nerve function due to edema and those caused by direct contusion. Operative treatment is indicated, however, in the third type, that with pinching of callus, and in the fourth classification, the tearing of the nerve should be sutured immediately if conditions allow.

As mentioned above, operation should be done for pressure hematomas which, of course, require immediate opening in order to allow the arterial pulse to continue through and avoid ischemic paralysis.

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In the course of operating certain of these nerve injuries it may be necessary to do merely a lysis for adhesions, freeing up the nerve and transplanting it. If, in the case of a severed nerve, the nerve be too short, obviously the nerve cannot be lengthened so the humerus must be shortened. If there is a bulbous neuroma at the end of the posterior fragment, it will have to be cut off and fresh fragments of nerve brought together, but not too tightly, which will cause the ends to tend to splay out and form another neuroma.

INJURIES AROUND THE ELBOW

Dislocation of the elbow may result in reducing the ulnar nerve into the joint; such a condition requires immediate operation. Wounds of glass or a knife may injure the ulnar nerve at the elbow but such wounds more usually occur in the wrist where the ulnar nerve seems to be particularly affected by this type of injury.

In the reduction of certain dislocations of the elbow the ulnar nerve may be reduced into the joint, requiring immediate operation and transplanting the nerve forward of the condyle. Certain *condylar fractures* with excess callus require the same procedure to free the patient from pain of nerve pressure behind the inner condyle. A very few severe contusions of the ulnar nerve cause adhesions and thickening of soft tissue around the nerve so that forward transplantation is indicated.

INJURIES AROUND THE WRIST

Involvement of nerves may occur in fractures in the region of the wrist. *Colles fractures* with considerable displacement stretches nerves as well as tendons, and fracture of the ulnar styloid may produce a disability of the ulnar nerve. *Barton's fracture* may produce injury to the medial nerve at the wrist. Loss of sensation of the median distribution into the hand may retard the return to occupation long after the motor power has been completely restored.

There is another condition known as *Sudek's atrophy* (traumatic arthritis) concerning which we might know a lot more which frequently does follow Colles fracture, particularly in women between the ages of fifty to sixty years. This reddens the skin, causes puffiness of the subcutaneous tissues and tightening of the tendons, and causes a long delay in getting a satisfactory end result.

The alternatives of failure in nerve repair probably may be best summed up in muscle transplant, fusion of certain parts or splint.

In this problem, as a whole, corrective splints and proper physical therapy play a tremendous part in rehabilitation. Without this aid our results could not be so good.

Part II

The Role of the Physical Therapist

Charles H. Bradford, M. D.

Doctor Morrison has described the surgical care of nerve injuries in the upper extremity very thoroughly. In discussing his article, my remarks shall be confined to one aspect of these injuries and of the physical therapy connected with them which too often is neglected; that is, the personal and psychological side.

When a radial nerve is torn in connection with a fracture of the humerus, it may take surgeons an hour or even two hours to repair it. That is a fairly long operating time. But after that, it will take two, four, six months, or a year before the nerve will be regenerated. During that period, the patient remains disabled. He returns day after day and week after week to the physical therapist. As therapists, we should focus our attention on this long convalescence, and we should try to appreciate what it means to the patient—what effect it has on personality and mental outlook.

Most of these patients were engaged in active occupations before their injuries occurred. They had the interest of their work, and they had the satisfaction of earning a living. The injury changes all this. Instead of a steady wage, they must face steady expense without the normal income to balance it. Instead of a job to absorb their minds, they find only one object on which to concentrate: themselves, and particularly, their

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disability. This must be emphasized in order to point out that the injury has produced not simply physical trauma. Even more severe is the psychological trauma. It completely wrecks the patient's mental and social environment. It substitutes a subjective, neurotic outlook for one that had been objective, healthy and normal.

When patients, with this changed outlook, come back to the surgeon's office, is it any wonder that they seem discouraged at times? Is it surprising if they have lost their ambition? As they go along, week after week, we must remember that they will hardly be able to notice any improvement — for their progress will be too slow to be appreciated. They will begin to doubt our efforts at encouragement and may even become resentful of our optimism.

If we once appreciate the factors at the root of this change of attitude, it helps us to counteract them — and it is very important that we should do so. Unless the patient continues to cooperate with his physical therapy treatment through the long, seemingly hopeless weeks, we all know that his condition may become really hopeless. Temporary contracture of tendons may lead to permanent loss of function. The period of discouragement which accepts atrophy and stiffness without combating them is the most dangerous complication in after-care. For this reason, the physical therapist deals primarily with a mental condition and only secondarily with a muscle or nerve condition. Of course, nerves must be surgically repaired and muscles must be exercised; but what makes the muscles move? A nervous impulse. And what initiates the nervous impulse? The mind. It is almost unbelievable how much recovery the right mental attitude can bring about, and equally unbelievable, though we have all seen it, the amount of disability and paralysis that the wrong mental attitude can produce.

We should be careful how we use the word neurosis in this connection. Our patients may claim to be more disabled than we think is justified, and we may blame that on their state of mind. But unless that state of mind is a habitual part of the personality, those people are not true neurotics. Recently we had a patient who had broken his toe six months before and had not walked since then. No deformity could be found on examination; and x-rays showed a perfect fracture repair. A good physical therapist started treating this patient. In three weeks we returned him to employment. We had not, in any sense, healed his fracture, but by massage and exercise and sympathetic encouragement, we had healed a very much injured personality.

Before concluding, one other mental obstacle which very frequently opposes the success of physical therapy should be mentioned. We are all familiar with it in the patients we see every day. *Indolence.* The patient will do his exercises while he is in the office being instructed, but he puts them off and neglects them after he has left the office. Even at the very best, when the patient can afford daily treatments, the exercises he will get under supervision represent only a small part of the twenty-four hours. During the rest of the time, he allows muscles to contract and atrophy. Patients have an inherent, superstitious belief in miracles, and they think that an electric lamp or diathermy machine can cure them in this way. Of course, a miracle is the easiest way to accomplish anything—certainly it is the laziest way—but it never, never works. The real miracle (and it sometimes seems a true miracle) is the result that the physical therapist can accomplish by overcoming indolence, by fighting the patient, and by bullying him into real cooperation so that together they restore normal function. There is no definite way to do this, because it is different with each patient. One suggestion is to challenge the patient—offer him a task which he can perform only by effort of his own. Dare him to do it; or, as the children used to say, "stump him" to do it. There is fun in being "stumped." Another suggestion is to shame him. Make the patient feel guilty if he comes back to you without having worked hard enough. For example, one of my patients—an artillery colonel in the National Guard—had had a back strain which was greatly improved under treatment. A month or two later when asked to return for a check up, this bold, military man replied frankly, "Doctor, I am afraid to go back, because lately I have not kept up with my exercises, and I would not dare face your physical therapist."

There is no more to say on this subject. Those who practice physical therapy recognize such difficulties as have been mentioned far better than many doctors who order the treatments. It is by recognizing them and appreciating their importance that they can be overcome. In this respect, physical therapy is an integral part of the attempt which sur-

gery initiates: the long process of making the injured man well. Surgeons restore the anatomy by operation. The physical therapist completes this and restores function by persistent treatment. It is a great deal more than what we ordinarily mean by treatment, however—it is human understanding, patience, optimism, and perseverance.

Part III

Physical Therapy Treatment

Lucy G. Marshall

The following cardinal principles should be observed in the treatment of all cases.

Heat

(1) Sensation as well as motor power has been disturbed and heat must be applied with caution. Never depend on the judgment of the patient as to the quantity of heat produced. Test frequently with your own hand. It is for this reason that it seems wise to use infrared or carbon heating elements rather than diathermy. We have never had a burn produced by infrared when this technique has been used even with total loss of sensation.

(2) Heat must be used over a long period of time—weeks to months—therefore, it is extremely important that overdilation of capillaries never takes place. Overheating causes an overdilation and permanent obliteration of capillaries leaving an area with a decreased blood supply and a brown and mottled skin. This is unsightly and does not speak well for the ability of the physical therapist. It is wise to use half the heat usually necessary to produce complete hyperemia, and even less for blonds and those women with a delicate skin.

(3) Supplementary heat to be used at home.

Sand baking—Cover a large box with oilcloth to prevent sifting of sand. Fill three-quarters full with sand (which may be procured at a building supply store as well as at the beach). To heat: remove two to three quarts, put into a roasting pan and heat on top of stove. Mix into sand in box. Test with unaffected elbow. It should feel only as warm as the sand on the beach on a warm sunny day. Bury the part and allow it to remain covered twenty-five minutes. This may be used twice daily.

Hot water soaks are to be discouraged. The tissues easily become "waterlogged" and an already impaired circulation due to trauma and inactivity will be made worse.

The use of heating lamps in the home never should be left to the patient. Even the careful patient, anxious to get well, is prone to get close to the lamp "because it does not seem hot" and to leave the heat on longer than specified "because I didn't think it could do any harm and I am anxious to get better." Instruct a second person as to distance from the lamp and the time it is to be used.

Massage

(1) Muscles with motor nerve involvement —use technique as in anterior poliomyelitis.

(2) Muscles with atrophy due to fixation need stimulating manipulation to supplement in part for the activity necessary for good muscle tone until joint motion is allowed.

(3) The whole arm will need massage to increase venous flow and nutrition.

(4) If the arm is painful—Nerve compression and other sedative manipulations may be used to an advantage as long as the traumatised nerves are avoided.

(5) Unaffected antagonists will need to be relaxed and often lengthened.

This then means selective manipulations for individual muscles and muscle groups.

Exercise

(1) Passive — Stretching of any muscles which tend to overbalance in antagonistic strength. Any condition which produces or requires limitation of shoulder joint motion may and far too often does produce a bursitis. The complaint of pain in the region of the subdeltoid or subacromial bursa doubles the necessity for passive movement within the safe range for the shoulder. If neglected at this time the pain and accompanying restriction of motion often outlasts the original injury.

(2) Active—In muscle training following paralysis exercise is started from a stretch and carried through the full arc of motion, the physical therapist carrying out that part of the movement which the patient cannot

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accomplish. In the treatment of fractures active exercise is allowed only through the range of motion in which muscle pull will not tend to displace fragments. In the treatment of dislocations it is imperative that the position in which the injury occurred is not reproduced. Therefore, when dealing with a combination of paralysis and fracture or dislocation, or all three, the exercise technique must be changed to fit a variety of conditions. A compromise must be made. Static exercises frequently must be substituted for the usual muscle training exercises because the movement of the part through a full arc of motion would either change the position of fragments or produce a dislocation.

Specific Exercises

(1) Shoulder dislocation with deltoid injury.

(a) Pendulum exercises. Must be done with the arm held in inward rotation. *Antroposterior* and sagital planes, a dozen times in each direction and six or more times daily.

(b) Back lying—abduction with the arm held in inward rotation. External rotation with the arm held in adduction. Forward elevation in adduction—patient uses other hand to assist.

(c) Active use of the forearm and hand—occupational whenever possible.

(d) When the affected muscles can work against gravity, sitting exercises may be instituted. Be sure that the table is high enough to fully support the shoulder girdle.

(e) Add shoulderblade exercises.

(f) Overhead pulleys for increased range of motion. Never give combined abduction and external rotation before the ninth month, and do not look for complete range of motion before the end of a year. An attempt to establish full motion before that time may reproduce the dislocation.

(2) Fracture of the surgical neck.

Treat as shoulder dislocation. When union is solid the pectorals may be stretched, thereby hastening freedom in abduction. Passive movement is often ordered at two or three weeks. At that time do not attempt to increase the range of motion; move the arm through comfortable arcs of motion in all directions. This is done to prevent bursitis from position.

In cases with considerable brachial plexus injury it has been my observation that those patients in whom the return of function of the hand is fairly prompt and improvement progresses from the extremity upward tend to a more rapid and complete improvement than those cases in which the restoration of function is reversed.

(3) Crutch palsy. No exercises. This condition has been caused by pressure. Removal of the cause—restoration of function.

(4) Supraspinatus tear and atrophy.

Most frequently accompanies dislocations. Delay in return to full power in elevation against gravity for many months. Sacrifice full abduction, use the intermediate position. Static exercises to the muscle. Active exercises as soon as other factors will allow.

(5) Midshaft fractures with radial nerve involvement.

(a) If caused by edema and if relief is afforded promptly with massage, simple occupational exercises will be sufficient. There seems to be no advantage to detailed exercises.

(b) With contusion the same is true. Treat the injury, and as soon as nerve function is restored, use occupational exercises.

(c) Fracture with pinching callus. If a decrease in radial nerve distribution is noted it should be reported to the surgeon at once. Following operation and transplanting, muscle training exercises must be instituted.

(d) Fracture with tearing of nerve. Treat as for pinched nerve—the recovery is very slow and as motor nerves return to function care must be taken that affected muscles are not overused.

(e) Volkmann's ischemia promptly treated leaves an arm which, with the assistance of heat and massage and proper support, may be returned to perfect function through muscle training.

(6) Injuries around the elbow. Dislocation with ulnar nerve injury. Static exercises for triceps. Active muscle training for hand as soon as motor nerve function returns. The biceps is apt to be spastic and should be left alone except for relaxing massage.

(7) Sudek's atrophy. Passive flexion of all finger joints. Passive extension of wrist. Active exercises in finger flexion and wrist extension, and radial deviation. Occupational activities to increase range of motion and power.

(8) Colles fracture with nerve injury. If all the nerves have been stretched simple exercises in grasping and releasing a soft rubber ball may suffice. With an ulna or medial nerve injury it must be kept in mind that regardless of motor nerves affected, the hand must be kept in flexion until union is solid and that exercises must be given in ulnar

deviation. If this cannot be accomplished actively the movements must be carried out passively and the hand held in that position between exercise periods.

The Morton Smart machine may be used to combat atrophy of disuse due to fixation and also has proved to be a valuable adjunct to the writer as a testing agent for return of motor nerve function and by synchronizing the stimulus with the voluntary efforts of the patient a full contraction of the affected muscle may be produced.

As overuse produces fatigue to nerves as well as muscle fibers, long exercise periods should be discouraged. It is my belief that the best results will be obtained if each exercise is done four or five times in six periods a day and a total rest one day in seven.

Aids to Underwater Exercises

Barbara A. Nicoll

In the search for some method of supporting a flail paralytic arm of a patient during her hydrotherapy treatment, a piece of Hau tree (native to Hawaii) was cut into sections four or five inches long (diameter 2½ inches), varnished, and straps with buckles were attached to each section. As the wood is very buoyant, these floaters proved most satisfactory in supporting the weakened arm. Smaller floaters may be obtained for the younger patients. In the case of a totally paralyzed appendage, two floaters may be used — one above and another below the elbow or knee joint, as the case may be. This may be varied to meet the individual needs of each patient. The floaters may be shifted from the back to the front of the appendage when the patient assumes various floating positions. With the floaters attached to the patient's arm, he may go through his shoulder, elbow, wrist and finger exercises very easily by assuming a face float or back float, and by standing or sitting in water at shoulder level. However, caution must be taken to prevent the patient from standing in water below shoulder level, as this would permit the floaters to pull on the weakened muscles of the shoulder and arm.

Experiments were made with these floaters attached to the leg at various points, but the long wooden leg splint was found to be more satisfactory in affording the necessary protection to the weakened muscles of a paralytic case which is still showing signs of improvement. However, when a case of long standing is being given hydrotherapy merely for the exercise and psychological value, a nine-inch floater may be attached at the knee or two smaller floaters may be attached with one above and one below the knee joint. In this case, these floaters prove to be useful, as they buoy the leg and allow freer movement than is possible with the long leg splints.

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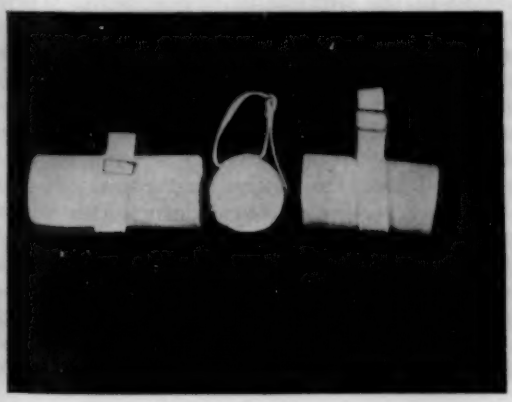

Physical Therapy in the Treatment of Chronic Arthritis*

John G. Kuhns, M. D., F. A. C. S.

Physical therapy always has been an important part of the treatment for chronic arthritis. It is becoming of even greater value as the patients are coming for treatment at an earlier stage of the disease and as we are learning better methods of preventing and correcting deformities. There are many useful forms of physical therapy which require elaborate apparatus and specially skilled technicians for their application. We shall not discuss these but we shall speak only of those simple measures which any physical therapist can apply in the home. During the past twenty-five years these simple measures have been found adequate at the Robert B. Brigham Hospital in the physical therapy treatment of the majority of patients suffering from chronic arthritis.

Chronic arthritis of both the atrophic and of the hypertrophic type must be looked upon as a systemic disease with its most troublesome manifestations in the locomotor system. Any comprehensive treatment must include general measures to improve the patient's health and to combat infection or any other known cause of the disease, and also local measures to decrease pain and to prevent disturbances in the function of the joints. In the severer forms of the disease surgical procedures and prolonged periods of vocational training often are necessary. In the milder forms of chronic arthritis treatment often is simpler and of shorter duration. But even here a prolonged period of observation and treatment is required in order to secure the greatest possible return of function in the joints and to prevent a recurrence of the arthritis.

We shall describe three forms of treatment which you, as physical therapists, can apply in any home, without special apparatus or skilled assistance. These are: (1) rest; (2) heat; (3) exercises. These are all the local measures which we commonly use in the treatment of chronic arthritis. By using these carefully and persistently, pain and muscular spasm will be relieved and deformities will be prevented.

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Rest

In the active stage of chronic arthritis, that is, when the joints are tender and swollen, and motion is painful, we must remember that we are dealing with a patient who is suffering from a serious constitutional disease. The patient must be treated as well as his joints. The general care of the patient will be the physician's responsibility. But the physical therapist must bear in mind that the patient is ill and is weak. By over-use of any physical therapy procedure he can be fatigued and made worse.

One important therapeutic measure is general rest of the entire body, a part of the upbuilding program in any chronic disease. In providing general rest, by keeping the patient in positions which do not flex the spine unduly, deformities and added strain upon parts of the body can be prevented. The patient should be first of all upon a firm bed which does not sag in the midportion. For the most part only one small pillow should be kept under the head unless there is a fixed flexion of the cervical or dorsal spine. Where this is present the added pillows are removed as the deformity is corrected. Keeping the patient recumbent in this manner conserves strength and prevents undue strain upon the muscles of the back. It promotes good body mechanics with increased vital capacity and improved function of the diaphragm. It also aids in correcting postural deformities which may have developed in the spine and thorax. If further correction of thoracic deformity is desired this can be corrected gradually without undue discomfort to the patient by using a pillow under the dorsal spine for short periods of time, several times a day. At such

times it is helpful to flex the knees and put the hands back of the head, in this way using the accessory muscles of respiration to raise the chest.

This general rest in bed is continued until the patient begins to improve, as shown by a gain in appetite, a gain in weight, or an improved feeling of general well-being. At the same time local rest is given to all of the affected joints. These joints are splinted as simply as possible striving to put the joint in the best position for future use if it should become stiff. This optimum position for function is usually the most comfortable position also. In the inflamed joints deformities usually develop in flexion from the muscular spasm which is present. All of these deformities can be prevented by watching the joints and keeping them splinted when they are painful. Plaster of Paris splints have proven to be cheapest and easiest to apply. They usually are made to encase only the posterior half of the limb. When the limb is held in them constantly the muscular spasm relaxes and the patient then becomes comfortable. Where deformity is already present, gradual correction of deformity is obtained with such splints and new splints are made when further correction of the deformity is possible. When full correction of the deformity is obtained and muscular spasm has subsided, splints are used only at night until the patient can rest comfortably without them and there is no longer any tendency to deformity. Most deformities which occur in chronic arthritis will respond to this gradual manner of correction. Where deformities have been present for a number of years or where ankylosis has taken place, operative measures usually are required to secure full correction.

EXERCISE

Exercise plays a very important part in the recovery from chronic arthritis. The patient who suffers from chronic arthritis usually has faulty body mechanics. This produces undue strain upon certain joints and increases deformity. It also leads to a number of physiological disturbances related particularly to respiration, circulation and intestinal function. Arthritis commonly will continue in inflamed joints until this extra strain caused by poor body mechanics is relieved. The patient suffering from chronic arthritis usually will show impaired peripheral circulation. By special bodily exercises, particularly those usually given as breathing exercises, the circulation can be improved and faulty body mechanics can be made better while the patient is lying in bed. Such exercises in bed usually can be given even when joints are painful and require constant splinting.

Exercises for the various joints are important both for the normal nutrition of the joint and to prevent muscular atrophy about the joint. They should be begun as soon as any painless motion is possible. Exercises should not cause pain or undue fatigue. They should at first consist of flexion and extension within the painless range of motion several times a day. It commonly will be observed that there will be a gradual gain in the range of motion sometimes from day to day. Where the range of motion is decreasing the patient usually has been exercising too vigorously. Here exercises should be stopped for several days and then begun slowly again. As increased motion and strength return, more complex and vigorous exercises should be given.

In the normal progress of convalescence the time will come for the patient to stand and walk. It has been the usual practice to delay walking until deformities have been corrected at the hip, knee and foot, and until the patient has developed a fair amount of strength about the hip, knee and ankle joint, that is, when he has been able to move the limb against a fair amount of resistance. Walking is permitted only for a short time at first and is increased as the endurance of the patient becomes greater. If pain persists in a joint after walking, or in any other use of the joint more than one-half hour, the patient has done too much. To avoid a recrudescence of the arthritis less use should be given to that joint for at least a week. In this way we avoid irritation and encourage healing in the joint. Any exercise or other use of the limb should cause no pain. After the patient is sitting and walking, local exercises for the joint and exercises to improve the body mechanics should be continued until the patient is using the entire body efficiently and without strain.

In elderly patients and in those who are very weak, exercise may be very difficult particularly at first. Here it often is wise to give massage associated with gentle exercises. The practice is to discontinue the massage as the patient develops facility in carrying on the exercises. Massage never should be given over a painful joint in chronic arthritis but should be wholly around the joint. Where it causes pain, massage should not be given. We

have come to believe that far greater benefits are secured from active exercises properly done than from massage.

HEAT

There are many ways in which you can apply heat to the inflamed joints of chronic arthritis. In a hospital with an adequate number of nurses we have found hot fomentations to be the simplest manner. Cloths are wrung in as hot water as the hand will bear and then are applied about the joint. As the cloths become cool, they are changed. Such hot applications are given for about one-half hour several times a day. This has been a simple and relatively safe way to apply moist heat. We have found that the patients tolerate this moist heat better than dry heat. Baking lamps, electric pads and hot water bottles have proven equally efficacious as far as we can determine but these usually require more supervision in their use. Constant heat has proved no more helpful than intermittent heat in our experience. Heat should be applied to all of the inflamed joints. Splints at times must be removed for this. Dry heat sometimes can be applied without removing the limb from the plaster. For local application of heat to small joints, paraffin may be melted and applied either by dipping the limb into the paraffin or painting it about the limb. A coating of paraffin one-eighth of an inch is thus obtained. This will keep the limb warm for as long as one hour. The temperature of the wax should be tested either by the finger or with a thermometer before it is applied. The application of heat usually is discontinued when swelling, soreness and muscular spasm have subsided.

A useful method of applying heat to the entire body is the hot bath, if the process of getting the patient into the hot water is not too painful. Keeping the patient in as hot water as can be tolerated for twenty minutes to one-half hour often relaxes muscular spasm, stimulates the metabolism of the body and makes the patient generally more comfortable. Often the temperature is raised temporarily a degree or more. Such hot baths are quite depleting and usually cannot be used more than twice a week and should not be used with weak patients. They stimulate excretion through the skin and lead to a loss of chlorides. It is best to give the patients several glasses of water with a quarter of a teaspoonful of table salt in each glass before such hot baths are given. At the hospital we use a special form of hot bath, much like a Turkish bath, except that the patient is recumbent. Heat is secured by the use of steam. This form of therapy should not be used for very ill patients.

SUMMARY

Many different measures are required in the treatment of chronic arthritis. Since the locomotor system chiefly is affected, physical therapy is a very important part in the treatment. We have discussed three simple therapeutic measures, rest, exercise, and heat, which can be applied in any home by any physical therapist. These simple measures usually are all the physical therapy procedures which are essential. By the use of them much can be done to make the patient more comfortable, crippling deformities usually can be prevented and useful function in the joints usually can be obtained.

"Yf it be not a faire cleare day to goe not into the open bathe but rather use the water in a bathing vessell in your chamber as many men doe. . . . And if any man or woman be so poore or sicke yt they be not able to go to the baths of Baeth it shalbe wisedome to cause an artificial bath to be made at home by the advise of some learned and exper Phisition who maye put into his artificial bath brimstone, alum, saltpeter, salt or copper accordinge to the nature of the disease of his patient. . . . It shalbe good also to make their bath of sea water sodden with herbes convenient for the same purpose."—*From "The Baths of Bath" by P. Rowland James.*

Useful Methods of Examination as Related to Cause and Treatment of Painful Feet*

R. Plato Schwartz, M. D.,** Arthur L. Heath, B. S., Charles G. Brownell, B. A., and Walter C. Power

Chronic foot strain is an old subject and pronation is traditionally associated with the prevailing problems. The incidence of complaints is not diminishing, and the methods of treatment are numerous. It may be that the absence of professional agreement on principles accounts for the great difference in treatment and explains why foot strain has been supported "by steel springs," but not prevented. In 1912, Weed[1] stated that "original work on this subject has been almost entirely confined to orthopedic surgeons, but their treatises are so numerous that their very variety and number show a lack of unanimity of opinion, and are, to the uninitiated, recondite and confusing." We have experienced this confusion, since it is intimately related to our more complex problems.

For eleven years our inherent interest in the phenomena of human locomotion has fostered continuous work on this and related subjects. In association with these efforts it was necessary to unlearn certain acquired concepts as to cause and treatment of symptoms associated with pronation. Evidence obtained from the analysis of more than 2000 records of human gait and experience gained from clinical observations makes us reconsider these original opinions, although they came from valued sources. Because of the new and fundamental character of our information, this old subject is presented for review.

Clinical observation has established the premise that pronation prevails in practically all children and adults. On the basis of incidence it is a normal finding with which children infrequently complain of growing pains, while in adults the more pronated foot may be the least painful. Such feet in repose present normal contours, but under the influence of weight bearing they show variable degrees of pronation—all of which, despite apparent contradictions, defines symptoms as an expression of abnormal function for which there has been inadequate compensation. Stated in another way, pronation may be painless over a period of years, terminating in discomfort when compensatory influences become inadequate for the prevention of symptoms resulting from abnormal function.

The acceptance of this premise is in accord with fact, but it does not explain the prevailing incidence of pronation, the forerunner, the companion, if not the cause of painful and deformed feet. But the premise is of particular importance as a basis from which we may analyze the factors that cause all feet to pronate under the influence of weight bearing.

This is clearly a functional problem in which certain structures are of primary importance. Exclusive of the proximal members associated with the reflex act of human gait, the foot and the leg must be considered as one single instrument whose many parts are accurately adapted to each other, for the coordinated split-second action which is necessary for this function (John Cross[2]). It is this mechanism with which we are concerned; therefore, the description of structure and structural relationships is required just insofar as they serve certain useful or indispensable purposes.

All subsequent remarks regarding structure in relation to the leg and foot while walking will refer to the heel as that portion of the foot which primarily receives and secondarily supports weight;[3] the midfoot which primarily supports weight, and the forefoot which primarily propels the body forward and secondarily supports weight. This is actually what these three divisions of the foot should do in the stance phase of every step (Fig. 1). The manner in which these three divisions express foot function, therefore, determines the degree of individual efficiency in walking. Through precision records of the sequence

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and duration of the time which each division functions, we may accurately examine and evaluate the foot in motion. This method of study has emphasized the invariable presence of pronation (Fig. 2) as readily as it has revealed the functional abnormalities associated with calcaneus, equinus, varus and valgus deformities resulting from infantile paralysis. Precision records as well as clinical observation, therefore, support the premise from which we inquire into the cause of this high incidence of pronation favoring foot strain under load transmitted through the tibia in stance and locomotion.

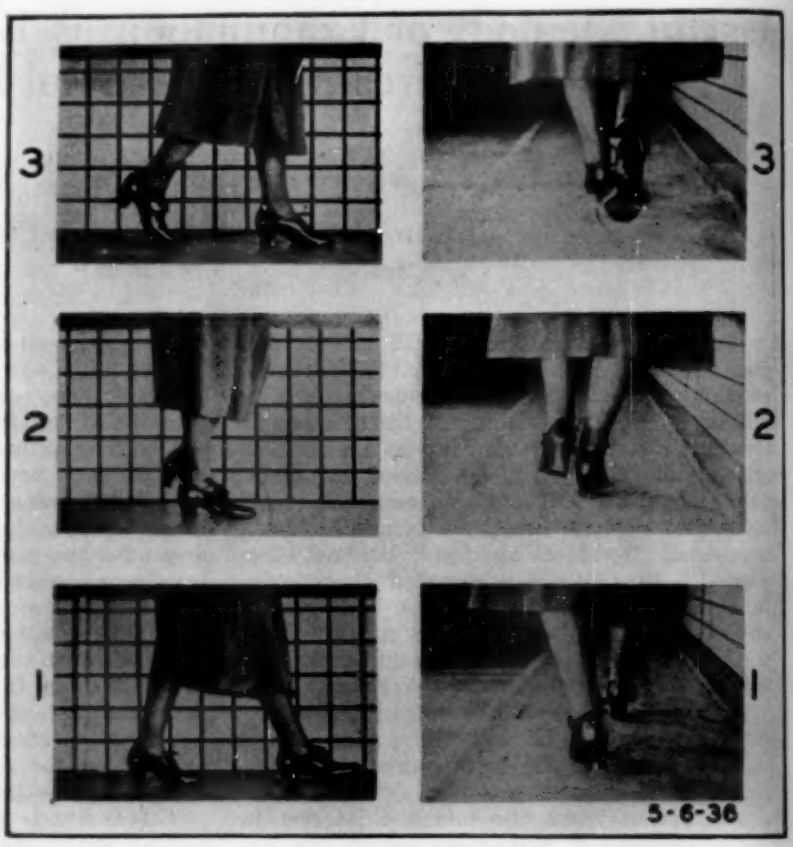

Fig. 1. The stance phase of right foot in normal gait.
1. Heel reception and support of weight.
2. "Midfoot" support of weight.
3. Forefoot propulsion and support of weight.

The functional unity of the foot and leg may be regarded as a foundation on which rests a weight-supporting column. The stability of such a column is determined by its alignment with and the character of the foundation upon which it rests. The tibia and astragalus may, in fact, be considered a column resting on the os calcis. Instability is favored by three characteristics which are common to all human feet: (1) the inclination and contour of the articulation which joins the column to its foundation; (2) the displacement of the weight-bearing axis of the column 1.5 centimeters medial to that of the foundation upon which it rests; and (3) the hemispherical weight-supporting surface of the os calcis which is made irregular by one or more bony tubercles. These combined structural characteristics prevail in all human feet and favor instability, in the direction of pronation, proportional to the variables which prevail in respective individuals, but they are never absent. It is for these reasons that the valgus position of the os calcis described by Lovett and Cotton[4] in 1898, and L. T. Brown[5] in 1912, is invariably present in stance as well as in the second period of the stance phase of gait.

In 1908, Robert B. Osgood and Arthur Legg[6] stated that investigation revealed that adductors of the foot were normally stronger than the abductors by a ratio of 4 to 3 or 5 to 4: "That as the pulls became more equal, abnormality of habitual weight-bearing lines occurred, and that when the abductors became the stronger group, foot strain was almost constant on any prolonged use of the feet." In 1912, Robert B. Osgood[7] stated that "the most common existing cause of foot strain we shall probably all agree to be the modern ready-made shoe, and, unfortunately, many of the custom-made shoes as well." We may add with positive assurance that conventional footwear has remained fundamentally unchanged during the past twenty-five years. However, the improvement in symptoms associated with

increased strength of the adductors following exercises as reported by Osgood and Legg is logical. It is joined by the required functional integrity of all intrinsic and extrinsic muscles to prevent the foot from becoming plain and unfit for the journey.

But we are not justified in believing that all prevailing pronation is due to relatively weak muscles. Standing is usually expressed by a sinking into position, pronation. This can be prevented only by voluntary effort. It is expressed by wilful contraction of the posterior tibial muscles which cannot long continue the required effort because of ensuing fatigue and discomfort. Moreover, we have thus far been unable to record contraction of the posterior tibial muscle during the middle third of the stance phase of the step when pronation is so frequently recorded during the act of walking. It is generally accepted that the posterior tibial is the primary if not the only adductor muscle which is effective in the correction of pronation. But, the facts just recorded indicate that it does not reflexly contract to prevent this position of the foot in either the act of stance or the stance phase of locomotion. This position of the foot is made most evident by the lowering of the (astragalo-scaphoid) talo-navicular level under the influence of weight bearing. This position is the end result of a motion which begins in the os calcis.

Our clinical and laboratory experience made it most evident that pronation is possible only when the os calcis is in valgus; nor can the effects of foot strain be adequately relieved without preventing the valgus position of the os calcis. But again there is only one tendon attached to the os calcis, and it never prevents, although it may definitely aggravate pronation. The tendo achillis and associated muscles may be short due to congenital or acquired causes. When present, this shortening provokes limitation of dorsal flexion of the foot held in varus with the knee extended. Usually, however, such a foot can take the right angle relationship with the leg when it is placed in valgus, or the position of pronation. Such shortening constitutes a major extrinsic cause for strain in the unit mechanism of the foot and leg. It aggravates the osseous structure, forming the foundation on which rests a weight-supporting column.

Efforts have been made to learn who first elevated the shoe heel to compensate for this limitation in normal dorsal flexion but they have been as unsuccessful as the principle is sound. Available evidence conclusively reveals that strain on these and related structures cannot be fully relieved without this compensation for the prevailing shortening in the posterior structures.

This congenital abnormality may prevail in children, men and women. In the latter we are invariably presented with the gross evidence of added limitations to normal dorsal flexion resulting from adaptive shortening. Such findings indicate the need for shoes with a heel height suited to the individual to provide comfort in stance and locomotion. Such a requirement has been recognized previously, but it was not accompanied by a method of measurement to be applied in association with the fitting of footwear. We are of the opinion that the determination of this measurement is as fundamental as any of the other

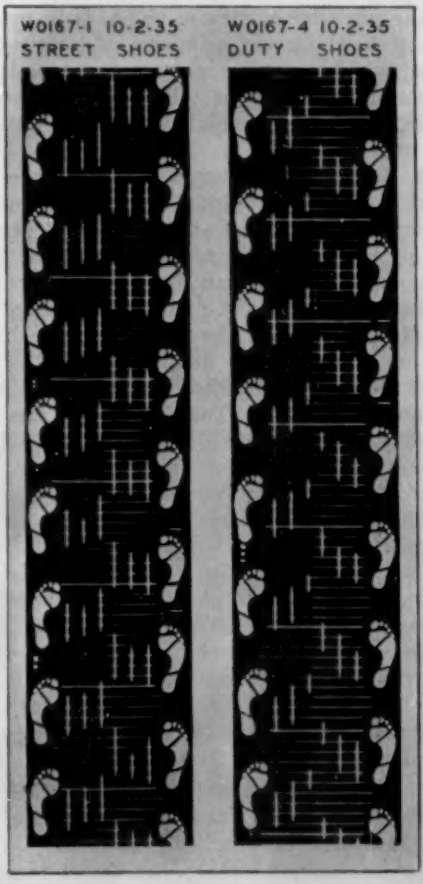

Fig. 2. A typical record of foot function in pronation. The associated foot strain predisposes to symptoms. W0167 — 1 = pronation, W0167 — 4 = pronation corrected by unaltered shoes.

criteria regarded as essential for the proper fitting of shoes in relation to function of the foot in motion. For this reason we developed the heel-meter and have provided instruction for its use in the fitting of footwear.

The three intrinsic characteristics of skeletal structures which predispose to the valgus position of the os calcis express the primary cause of pronation. The principle of the Thomas heel was sound, as applied for the correction of this cause, but it failed for several reasons —chiefy because the heel of the foot could not be held in the position of varus by the counter around the heel of the shoes. In 1912, L. T. Brown announced the same principle expressed in a steel plate with an elevated medial border. In all of the references on this subject, beginning with John Cross in 1819, Brown's was the only one found to express an effort at preventing the foot from going into the position of strain. This is in marked contrast to the great numbers of longitudinal arches which are variable in material and construction but all of which are applied to support a weakness which they could not possibly prevent.

But disuse joins hands with misuse and abuse in causing painful feet. It impairs function of specialized structures and proportionately lowers the threshold of comfort. Steel plates splint the human foot and, therefore, provoke weakness from disuse. Besides which we have found that the simple wedgeshaped elevation placed at the medial side in the heel of the conventional shoe does not express maximum efficiency. Too frequently the heel of the shoe is so large that the heel of the foot will slide into the valgus position.

For this and other equally important reasons thoughtful inquiry was directed to the principles underlying the construction of conventional footwear. By the use of electrobasograph and moving pictures our earliest investigation revealed the predominating instability of feet in conventional shoes. Simultaneous weght bearing on heel and forefoot was always present, and in many instances, no weight was passed through the midfoot to the fifth metatarsal head. It became evident that shoes made on the basis of contours of the foot at rest did not meet the functional requirements of the foot in motion. When shoes were made to meet the functional requirements of the foot in locomotion, the double weight-bearing time for the heel and forefoot was reduced from 0.18 seconds to 0.05 seconds. This figure represented the average in twenty-four nurses studied in regard to this point.

Stated in another way, an average of sixty-four per cent of the pronation was removed by the new design of lasts as compared to the prevailing pronation in twenty-four nurses using conventional lasts as provided in conventional fittings. For this high index of improvement, there is the following explanation of procedure.

We know that the act of standing invariably represents a sinking into position which constitutes pronation—the position of strain. This has always been confirmed by clinical experience. By voluntary contraction of the posterior tibial muscle the position of strain usually can be corrected for a time within the limits of muscular fatigue. These prevailing factors indicate the absence of reflex muscular contraction for minimizing the mal-influences of pronation, just as we previously indicated the absence of required muscular relationship to the os calcis, essential for the prevention of pronation.

But it is also necessary to present recorded evidence pertaining to the function of the posterior tibial muscle during the stance phase of gait.[8] May we here repeat that if the heel is held in varus, the forefoot cannot pronate. By contraction of the posterior tibial the heel is held in this position at the beginning of the first period of the stance phase of every step. But, invariably, pronation begins with the second period of the stance phase of gait at which time the posterior tibial ceases to contract. This important finding was revealed by recording the function of the extrinsic muscles of normal individuals simultaneously with records of their gait. From these investigations we are brought to the conclusion that there is no inherent reflex muscular contraction which prevents or efficiently compensates for the ever-present pronation of variable degree during the act of walking.

The maintenance of the varus position of the heel until after weight is fully transmitted through the midfoot to the fifth metatarsal head is positive security against strain-provoking pronation. The greatest efficiency of the foot in the reflex act of walking free from strain must, therefore, prevail when the heel has cleared the ground before the forefoot touches it. Then and then only can the forefoot most efficiently propel the body forward. Any method by which these requirements can be met, in accordance with the principles of

Hunter, may be considered ideal as regards functional efficiency of the foot in locomotion.

"If it is true—and I think it is true—that a knowledge of muscles is the beginning and the end of all orthopedic treatment, then Hunter merits our attention more than any other surgeon."[9] Muscle atrophy from long continued inhibition of function is common to practically all feet after middle age, and it is frequently present in earlier years. This is definitely related to conventional footwear.

Our investigation, therefore, was directed toward the development of methods through which the os calcis could be held in the position of varus and at the same time provide for improvement of muscle function in the reflex act of walking. The accomplishment of these two objectives required the development of a method of precision for the analysis of lasts over which shoes were made. For a period of three years, we worked on the development of the last-contour-graph, Fig. 3, with which we have since been able to make accurate contours of any last at any level from toe to heel. By this method of making accurate records of the design of lasts, we have been able to identify the characteristics essential for the improvement of foot function in stance and locomotion.

The prevention of pronation through maintenance of the varus position of the heel is a rule which has a rare exception. Both the rule and its exception requires reference to the functional osteology of the foot. Herein we find the reason for passive stabilization of the foot which will invariably prevail when the required principles are provided.

Specific reference is made to the functional relationship between the calcaneo-astragalar and calcaneo-cuboid joints. The concave-convex surface of the os calcis receives the calcaneal process of the cuboid on its medial aspect. Mobility of this articulation is a prerequisite for pronation. But motion of the cuboid is prevented when the os calcis is in varus, due to the contour of these respective articular surfaces of the os calcis and cuboid. A bilateral congenital anomaly has been revealed by operation on only one patient. In this instance the calcaneo-astragalar joint was a plane surface and the os calcis was fixed in valgus. Arthrodesis was required for correction of the valgus deformity and stabilization. But such exceptions are, at present, regarded as a distant relative to our present considerations because careful study had indicated their rare occurrence.

The strongest evidence in support of this principle for the prevention of pronation has been found by the application of its use in conventional rubber boots. The design and contour of such footwear expresses the least relationship to the morphology of the foot which is loose in the boot, having no resisting heel counters. Even with these adverse influences, pronation can be prevented passively by holding the heel in varus. This is revealed by x-ray negatives recording the position of the feet while standing in boots, with and without insoles. The insoles consist of a cork

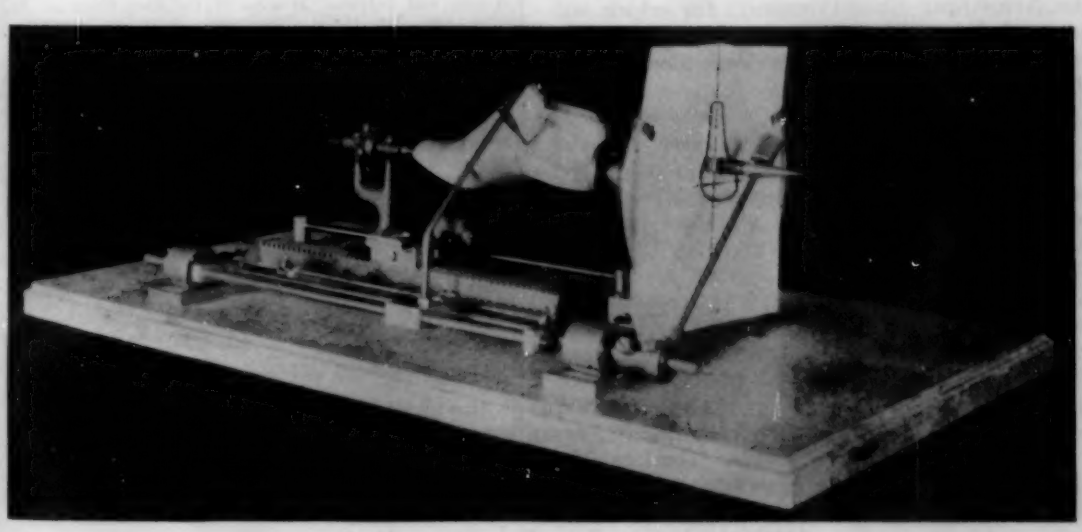

Fig. 3. The last-contour-graph.

heel cup with one-quarter to three-eights inside elevation with a three-eights to seven-sixteenths longitudinal pad. These are covered with leather. The efficiency of application is dependent upon accuracy of fitting the plantar surface of the heel and prevention of the valgus position of the os calcis in the second period of the stance phase of gait without splinting the mobility of the foot in locomotion.

This brief summary applies to one phase of our problems in the gait laboratory. It has emphasized to us the great difference between conjecture and fact as related to all questions regarding human locomotion. Any effort directed toward a more full understanding of Nature's function first reveals her elusiveness. For this reason our experience makes us aware that true understanding of any of the phenomena pertaining to human locomotion cannot be attained by short cut methods. The application of physical laws through the use of precision instruments borrowed from the fields of chemistry and physics has provided for many of the important advancements in the art of medicine. In this instance it has been necessary to devote much time to the development of instruments of precision for application to the solution of our problems.

Herein there has been expressed by various Rochester industries a superlative degree of helpfulness. Technical assistance has been graciously rendered by the Eastman Kodak Company, the Bausch and Lomb Optical Company, the Taylor Instrument Company, and the Armstrong Shoe Company, for which we acknowledge full appreciation. The results enumerated were directly dependent upon these resources.

CONCLUSIONS

1. Pronation, on the basis of incidence, is a normal finding frequently present without symptoms.

2. Considering the foot and leg as a functioning unit, reconsideration has been given to the intrinsic and extrinsic causes of pronation.

3. The presented evidence from precision records indicate that there is no involuntary muscular protection against pronation in stance and locomotion.

4. Reference has been made to the fact that the forefoot cannot pronate if the heel is held in varus.

5. Attention has been directed to the fixation of the cuboid on the os calcis when the heel is in varus, as compared to its free mobility when the os calcis is in valgus.

6. By the application of this principle in the modeling of lasts for nurses shoe, 64 per cent of pre-existing pronation was removed during locomotion.

7. Voluntary correction of pronation while standing in conventional rubber boots was equaled by passive prevention when this principle was applied by alterations placed in boots.

REFERENCES

1. Weed, Captain F. W.: Medical Corps U. S. Army, A Study of the Foot and Footwear. Military Surgeon 30:170, Feb. 1912.

2. Cross, John: On the Mechanism and Motions of the Human Foot and Leg. Young, Gallie and Co., 1819.

3. Schwartz, R. Plato; Heath, Arthur L.: Some Factors Which Influence the Balance of the Foot in Walking. The Stance Phase of Gait. Journal of Bone and Joint Surgery. Vol. XIX, No. 2, 431-442, April 1937.

4. Lovett, R. W., and Cotton, F. J.: Some Practical Points in the Anatomy of the Foot. Boston Medical and Surgical Journal Aug. 4, 1898.

5. Brown, L. T.: A Consideration of the Action of the Extrinsic and Intrinsic Muscles of the Foot from an Anatomical and Mechanical Standpoint. American Journal of Orthopedic Surgery. Aug. 1912, pp. 10-18.

6. Osgood, Robert B., Legg, A. T.

7. Osgood, R. B.: Pathologic and Symptomatic Weight-bearing. A Consideration of the Prevention and Cure of Foot Strain. American Journal of Orthopedic Surgery, Feb. 1912.

8. Schwartz, R. Plato; Trautman, Otto; Heath, Arthur L.: Gait and Muscle Function Recorded by the Electrobasograph. Journal of Bone and Joint Surgery, Vol. XVIII, No. 2, 445-454, April 1936.

9. Keith, Arthur: Menders of the Maimed. Oxford Medical Publications, p. 8, 1919.

For the relief of pains in the chest, cupping was widely used over an extended area. The simplest form and the one having the largest vogue was scarification followed by suction by the mouth.—*From "Medicine Among the American Indians," by Eric Stone, M. D.*

Metabolism

Francis Cooley Hall, M. D.

Metabolism is the term used to signify the activities that take place in the cells of species of the animal or vegetable kingdom by which chemical substances are transformed into energy or growth. The ultimate source of these chemical changes is food. Thus the ultimate use of food is its metabolism by way of tissue cells into energy or into growth. We may speak of the metabolism of a leaf, of an amoebae, of a sparrow, of an elephant, or of man. We may speak of the metabolism of a blood corpuscle, or nerve tissue, of muscle. We may speak of the metabolism of foodstuffs—of fat, of carbohydrate, of protein. As generally used in medicine—clinical medicine—the term means the process of changing food into body tissues, and the speed of this process.

Long before modern methods of study, certain evidences of abnormal metabolism must have been evident to clinicians—for instance, the loss of weight which accompanies uncontrolled diabetes, the increased skin temperature and wasting which accompanies fever, and the loss of weight and occasional fever of people with hyperthyroidism or Graves's disease. Variations in the metabolism during strenuous work as against the metabolism at rest must have been observed by the housewife who had to breakfast her farmer husband on apple pie, meat, and doughnuts, but who noted that the quiet school teacher who lodged with her ate much less.

Normal Metabolism. In order to live, man has to burn food. If he takes no food by mouth, he burns the fat, protein, and carbohydrate stored in his own body. He burns this through the use of oxygen, and in this process of burning, he gives off carbon dioxide, heat, water, nitrogen, et cetera. The early investigators learned this. This process constitutes metabolism. A tremendous amount of work by investigators during the past century was done on this subject of metabolism. Before learning how to measure the rate of this process, these students had to learn about foodstuffs themselves—how many calories are produced by a unit of fat when it burns, or of carbohydrate, or of protein, and how much oxygen is required to burn a unit of such food. To learn a man's basal metabolism they had to find out how much oxygen a patient used and then interpret this in terms of food. The complicated studies required to learn this shall be omitted.

The first metabolism tests were done in a closed chamber or small room. All sorts of tests were required, but the chief measurements were the direct measurements of the oxygen consumed and the carbon dioxide given off. This is called direct calorimetry. To determine a man's minimal food or energy requirements, these studies were done with the patient at rest, without the influence of food (that is, 12-14 hours after the last food was eaten). This is called the basal metabolism, or the basal metabolic rate. Energy or food requirements under these conditions were found to vary with age, sex, height, weight, but especially with body surface. They vary still more in disease. A resting man required 25 calories per kilogram of body weight (about 1900 calories for a man weighing 170 lb.). He requires seven times as much food if he is working as a carpenter, sixteen times as much if he saws wood. A Maine lumberjack may require 8000 calories. A physical therapist weighing 140 lb. and working 8 hours should not require more than 3000 calories. A growing body requires more food per kilogram of body weight than does an adult. These matters of energy requirements, due to variations in metabolic rate, are important if one is treating diabetes, obesity, typhoid fever, feeding employees, or feeding growing children. In planning diets, the dietician can figure caloric requirements, plan to give the required amount of protein, and then arrange the fats and carbohydrates in the needed or in attractive proportions. There are better and worse ways of doing this, and it is not always easy to do it satisfactorily when vitamins have to be considered, as well as indi-

372 Marlboro Street, Boston, Mass.
Read before the Massachusetts Physiotherapy Association, November 1, 1938.

vidual tastes. A certain technician has been assigned the difficult task of making a 600 calorie diet attractive and complete for a relatively inactive, fat patient who has been bedfast for five years with arthritis. The patient is walking some now, but in order to accomplish this, she must lose more than the 35 lb. she has lost already. The dietician has other problems, for some people are intolerant of much fat, or of much carbohydrate—this despite the fact that Eskimos may live on a diet 80 per cent of which is fat, and a Chinese coolie may live on a diet 80 per cent carbohydrate. In treating obesity, food requirements can be figured (even though the metabolic rate may be abnormal due to glandular deficiency). A proper diet can then be prescribed. Loss of weight is thus a mathematical proposition—but, if you say this to some patients, you find it is a psychological problem as well.

Once methods were found for measuring the basal metabolism, normal standards had to be determined. This called for an enormous amount of work, for determination of basal metabolism had to be made on individuals of all ages, weights, et cetera. With normal standards for man at rest, other studies were made. It was found that certain things speed up metabolism—exercise, nervousness, massage, hot baths, fever therapy, pregnancy; that undernutrition or starvation lowers metabolism. It has been found that excessive heat in hot weather speeds up metabolism, that one can even get fever from too much heat, as well as from the effect from sunburn on the skin. Cold at first speeds up our metabolism. Our metabolism falls during sleep. An interesting phenomenon is hibernation of certain animals. They sleep for long periods of time with very low metabolisms.

Metabolism in Disease: Glandular Effect.

It was natural then to study the basal metabolic rate in disease. Patients with infectious diseases which produce fever were found to have a high basal metabolic rate due to an attempt on the part of the body to fight the disease. The higher the fever, the higher is the rate. It was found that certain people with enlargement of the thyroid gland (exophthalmic goitre) have an elevated basal metabolic rate. This explains why such people find it almost impossible to eat enough food to prevent loss of weight. These people suffer from the toxic effect of overactivity of the thyroid gland. They not only have a high basal metabolic rate and lose weight, but they are weak, nervous, sleepless, have a rapid heart, diarrhea, and even fever in extreme cases. Unless the thyroid gland is removed surgically and early, the heart becomes damaged. Following operation, if the heart is still normal, the patient may regain normal health. The basal metabolic rate has thus become the measuring stick for determining whether or not a patient has hyperthyroidism, and the degree of hyperthyroidism. It was the value of this test in hyperthyroidism, plus the invention by Benedict of a simple, portable machine for determining the basal metabolic rate that led to the widespread clinical use of this test by clinicians. This machine is a respiratory apparatus. It allows the patient to breathe in and out in a tube connected with chambers. The carbon dioxide is taken care of, and the amount of oxygen breathed is recorded. When this is adjusted according to the patient's estimated body surface, it can be compared to normal and expressed in per cent above or below normal. Unfortunately normal is not an exact figure. A person can be normal even if plus 10 or minus 10. Only by using this test along with the history and physical examination is it of sufficient value in making a diagnosis. The test is not fool proof and must be interpreted cautiously.

Later it was found that the basal metabolic rate is low after completely removing the thyroid, as low as minus 40. Thus it was found that thyroid activity accounts for not more than 40 per cent of the total metabolism of the body. The remaining 60 per cent is due to the metabolism of muscle mass especially, and perhaps to other glandular activity. Some of the patients in whom the thyroid gland had been completely removed developed a queer condition. This condition was recognized as occurring in the same regions in which hyperthyroidism (or goitre) developed. These people were fat, lethargic, anemic, had dry, pale, thick skin, and dry hair, with a swollen appearance of the face. There actually was swelling of the face and legs. The condition is called myxedema. Later, pieces of thyroid gland from sheep or pigs were fed these people, and the edema left them; they became thinner, active, normal. With the help of the basal metabolic rate, we can recognize both severe and mild types of myxedema or thyroid gland deficiency, supply this deficiency by giving thyroid gland extract in tablet form and relieve the patient of unpleasant and disabling symptoms. This condition and some types of goitre were found

to be due mainly to long continued lack of iodine. This lack of iodine is due to lack of iodine in the soil, and therefore, in the food, in certain regions of the world. This lack of iodine denies the thyroid gland a chemical necessary for the production of thyroxin. Thyroxin is the active principle manufactured by the thyroid gland. When this condition occurs in infancy, we have the cretin. Thus, iodine is necessary for the normal metabolism of the human body. As you see patients, you can notice this myxedema and the flabby muscles. There are actual changes in the muscles, visible under the microscope. A person with myxedema will complain of fatigue just from doing her hair in the morning.

Other glandular deficiencies can cause a low basal metabolic rate. Some women whose ovaries have been removed will have a low basal metabolic rate not always helped by thyroid medication and often corrected by our newer estrogenic hormones. The use of these hormones in operated women and in women at the change of life is proving of extraordinary value in relieving symptoms of fatigue, flashes, sweats, palpitation of the heart, joint and muscle pains—symptoms apparently due to an attempt on the part of nature to adjust by interglandular action to the loss of ovarian secretion.

A low basal metabolic rate may occur also when the adrenal glands have been damaged and lack normal secretion. Other diseases may be associated with abnormal metabolism. The blood diseases of leukemia and polycythenia may have very high metabolic rates. Leukemia is a disease characterized by an excessive production of white blood corpuscles. Instead of 10,000 such cells, there may be 100,000 per cubic centimeter. Polycythenia is a disease characterized by an excessive production of red blood corpuscles. Instead of 5,000,000 cells, there may be 8,000,000 or more. The cause of these conditions is unknown.

Mineral Metabolism. Thus we see that food is the basis for normal metabolism but that abnormal endocrine conditions modify its rate and thereby cause sickness. The food must contain certain minerals essential for the normal functioning of the body. It must contain iodine, or the thyroid suffers; it must contain iron or the red blood cells suffer; it must contain calcium and phosphorus, or the bones suffer. Lack of salt or sodium chloride due to excessive sweating or diarrhea gives muscle pains, or cramps. In steel mills or in building Boulder Dam, muscle cramps have been so severe that the muscles would be like board in hardness. Muscles would even rupture under the strain. These conditions are prevented or cured by giving enough salt to supply the needs. The lack of these minerals in the growing child is especially disastrous, but adults need these minerals as well. The study of the metabolism of any one of these minerals is especially difficult, for it means days of study of the intake and output in the subject used for study, with painstaking chemical examinations of food, feces and urine. Not only does food affect glands, as iodine lack affects the thyroid, but glandular activity affects the utilization of minerals. Thus an overactivity of the parathyroid gland takes calcium out of bone, increases the amount in the blood and causes excessive excretion of calcium. Its cause is not known, but the results are cysts in the bone and stones in the kidney. Its cure is the surgical removal of the excess parathyroid gland or adenoma (tumor). Lack of parathyroid gland secretion (seen especially years ago after too complete operation on the thyroid) led to tetany or spasm and convulsions, relieved by calcium in part and vitamin D. One might continue to comment on the relation of endocrine activity to minerals. One of the most recent discoveries is the relationship of the adrenals to salt or sodium chloride. A patient with destruction of the adrenal gland (Addison's disease), or lack of this glandular secretion may have a low basal metabolic rate, exhaustion, low blood pressure, a low salt content in the blood due to this lack of adrenal gland substance. To correct the condition the patient must be given not only adrenal cortex but sodium chloride, and large amounts of sodium chloride alone may greatly modify the disease symptoms.

Vitamins. During the last few decades another group of substances has been found to be necessary for proper bodily metabolism. These are the vitamins, and these chemical substances are thought by some to influence the metabolic rate via the endocrines, as minerals can do. Whether they influence the basal metabolic rate or not, they are essential to normal health. These vitamins act as energizers in burning food, and they do other things which we recognize best by noting the effect of their lack in the human body. The hard papules often noted on the dry skin of a patient may be due to vitamin A deficiency. If

this same patient has had a motor accident at night, it may be due to the relative night blindness which is another symptom. Such a patient has been taking in his diet too little cream, butter, eggs—the yellow foods, and banana, carrots, cabbage. Another patient may be having physical therapy because of neuritis. There may be many causes of this, but one possibility is lack of vitamin B. Along with the neuritis there may be muscle wasting, edema, undernutrition, flatulence, or even a large heart. This disease is beriberi. It exists among us, not merely in the Orient. This patient has lacked the vitamin present in *whole* grain, carrots, cabbage. Another patient may have "black and blue spots" in the skin, swelling of a joint, bleeding of the gums due to lack of vitamin C. This disease is scurvy. He needs more fresh fruit and vegetables, especially in the raw state, and especially orange juice and tomato juice.

Another patient may show a prominent breast bone, square forehead, bow legs. He had rickets as a child due to lack of the vitamin D in eggs and cod liver oil, together with the lack of sunshine with which to manufacture his own vitamin D. He may also have lacked sufficient calcium and phosphorus. Because of this lack, the growing bones did not develop properly, were soft, and grew badly, aided in this by the pull of muscles and weightbearing. Another patient may bewail the fact that she has no children. One cause of sterility is lack of a certain vitamin, perhaps more than one.

Thus it takes proper soil to make roses grow and proper food to make human beings grow and flourish. Lack of these food essentials is especially disastrous in the growing child, but these foods are important in the adult as well.

Scurvy recently occurred in a patient with chronic diarrhea. Beriberi sometimes occurs in the needy poor of Boston—in the old lady who lives on tea and toast, or the chronic invalid with finicky appetite, or in the obese patient who diets unwisely. Pellagra has been seen in New England patients, with symptoms of diarrhea and a skin sensitive to and irritated by light in chronic alcoholics. Indeed, chronic alcoholics give us many of these deficiency diseases, and the unemployed workman living alone on what money he can get. However, we need not develop these vitamin deficiencies if we eat a normal diet—adequate protein in meat, fish, poultry, cheese; plenty of calories in the concentrated carbohydrates and fats, and plenty of the "protective foods"—milk products, green vegetables, and fruits. With such a diet we can look with scorn on the vitamin "racket."

Pernicious Anemia. Boston is justly proud of the Nobel Prize winners, Dr. George A. Minot and Dr. William P. Murphy. They, with the help of Dr. Whipple of Rochester, New York, have made it possible for people with pernicious anemia to live. This was brought about by finding that the disease can be controlled if the patient will continue to use liver or stomach substance in the diet indefinitely. This therapy does not cure the disease, but it controls it. These men have brought the disease of pernicious anemia, previously fatal, into the realm of metabolic diseases, or a deficiency disease.

While we really do not know the whole cause, it appears that the disease is due in part to inability of the body to manufacture building material for the development and maturation of red cells. This building material should be formed in the stomach, and Castle has shown that this X factor, which needs to be present in the stomach, is absent in patients with pernicious anemia. Castle calls this an intrinsic, or X factor. Extrinsic factors must be present as well if the body is to function or metabolize normally. Without this intrinsic, or X factor, the blood cells growing in the bone marrow do not mature normally, and young, immature cells are thrown into the circulation and easily destroyed there. The patient becomes anemic, weak, breathless from want of oxygen-carrying blood cells. He has indigestion and a yellowish skin. He may have a sore tongue and numbness of the hands and feet. He may have loss of position sense in the feet or other evidences of damage to the central nervous system. While the patient never seems to recover his lost ability to manufacture this intrinsic factor, it can be supplied in the form of liver or stomach substance from other animals. The damage already done may not be reversible, but the disease may become arrested.

Thus metabolism proves to be a broad term. It brings us into the whole realm of disease. It brings many unsolved problems, but the insight so far gained makes the future fascinating. In your work you can see defective metabolism operating in the patients whom you treat. Are these muscles you are massaging flabby due to lack of use, due to undernutrition, due to vitamin lack, or due to removal

of the thyroid or ovaries? Is this skin dry due to excess of sunshine, too little water, due to thyroid deficiency, or to some other gland deficiency, or due to vitamin A deficiency? Is the skin excessively moist due to fever, hyperthyroidism, the glandular imbalance of the menopause, or due to nervousness? Why the acne—glandular deficiency, bad diet, or skin infection? Why the poor posture—exhaustion, bad habits of standing, malnutrition, myxedema? Thinking about these things makes one's job more interesting, and such things as have been described above often help explain a patient's condition. They also explain, for example, why a patient fails to cooperate in doing corrective exercises. He may feel too miserable to do so. Such conditions, too, sometimes explain why a fracture fails to heal, or why arthritis develops in an injured joint. Proper metabolism is needed for the healing of disease or of injury.

Emotion. Our emotions have a profound effect on our metabolism. Cannon has shown this by his years of research in the laboratory studying what happens to a cat in the presence of a barking dog. Fear stimulates our adrenal glands by way of the sympathetic nervous system. The resulting effect on our bodies is an increased heart rate, rise in blood pressure and in metabolism, suppression of the secretion of the glands of the gastro-intestinal tract, increase in the sugar in the blood and in the rate of coagulation of the blood. The spleen contracts and throws more red cells into the circulation. All this occurs as a protective mechanism through the flooding of the body with adrenalin. This emotion can take away our appetite, give us indigestion or lack of digestion, or can give us diarrhea. It is a casual factor in producing duodenal ulcer and arthritis of certain types. Thus a sound philosophy with equanimity contributes to normal body function and to proper metabolism.

Diseases of Metabolism. It has been customary to speak of metabolic diseases, or diseases of metabolism. This classification of diseases has been used for want of a better one. As we know or find out the precise cause of a disease, we remove it from this classification into a more exact one. If one compares a list of diseases of metabolism given in a textbook of medicine of only 20 years ago with such a list given today, only a few diseases are common to both lists. For example, rickets and scurvy have been taken from the list and are placed with diseases due to vitamin deficiencies, and beriberi and pellagra are placed with them. Diabetes mellitus (sugar diabetes), diabetes insipidus (water diabetes), and gout are still on both lists. Diabetes mellitus is being more and more considered an endocrine disease, though its main feature is abnormal metabolism of starches and sugars, so that sugar is lost in the urine. The reason this disease is being more and more considered an endocrine disease is not due alone to the fact that only a certain per cent of such patients have damage to the pancreas, but because the disease is being more and more frequently tied up to other endocrine disturbances—disturbances associated with the pituitary, or adrenal, or ovarian glands. Why is diabetes in women twice as common at the time of the menopause? Why does fear cause sugar to appear in the urine? We are undergoing revolutionary thinking in our idea of diabetes as the result of the research work being done on animals.

Diabetes insipidus is characterized by an enormous excretion of dilute urine and by an enormous thirst. Thus it seems to be concerned with water metabolism. Its cause is not known but it is often associated with a pathologic condition in certain parts of the brain. Abnormal water metabolism of two other types occur: (1) a type due to lack of water, or anhydremia, and (2) a type characterized by inability to handle water, or edema. The anhydremia, or drying up of body tissues, is generally due to insufficient intake of water during fevers, or loss of body fluid from nausea, vomiting, and chronic diarrhea. Such patients have a dry mouth, dry lips and skin, loss of muscle tone, and they may have symptoms and signs referable to the heart, kidneys, and nervous system. The other type is associated with several diseases. We are familiar with edema due to failure of heart, kidney, or liver, or due to lack of vitamin B. Another cause of edema is too little protein in the diet, or protein starvation.

Gout, or gouty arthritis, is called a disease of metabolism. While we know a good deal about it, we still do not know its cause. It is characterized by an inability of the body to metabolize purine foods. Purine foods are contained in meat, fish, poultry, tea, coffee, chocolate, and to a lesser extent in many vegetables—beans, peas, mushrooms. The disease is often inherited. It is more common in those who overeat. Ninety-five per cent of the cases occur in men. As a result of this

fault in metabolism, sodium urate is deposited in different tissues of the body, where it replaces normal tissue, and may cause acute or chronic inflammation of those tissues. In severe cases we find an elevation of the uric acid content of the blood, deposits of uric acid in the lobes of the ear (tophi), and destructive areas in the bone, seen by x-ray pictures. When deposited in tendons and cartilages of joints, the urates seem to be the main cause of attacks of acute gouty arthritis. That this is due to the crystals of urates plus trauma is suggested by the fact that most men have their attacks in the foot or knee. The object of treatment is not to cure the disease, for there is no proof that this can be done, but rather to keep the disease in subjection. This is usually attempted by abstention from foods highest in purines, keeping the weight down, forcing fluids, increasing the metabolism, avoiding mechanical irritation of joints, and by drugs like colchicine.

Obesity still is called a disease of metabolism because we see patients who put on weight very easily, yet the cause is not clear.

Acidosis and alkalosis are abnormal conditions of metabolism. They occur in certain disease states. Acidosis may occur in diabetes, in association with cyclic vomiting in children, in chronic diarrheas, in severe heart failure, in infectious diseases. Alkalosis is usually associated with the ingestion of too much alkalis (as in treatment for duodenal ulcer), in association with prolonged rapid breathing or with tetany. In these conditions there is an actual change in the reaction of the blood and tissues—a change in the hydrogen ion concentration—towards the acid side in the case of acidosis, towards the alkaline side in the case of alkalosis. The term acidosis has been used loosely over the years. Rickets was once considered to be due to acidosis, as were also certain other disease states. The idea that we are often too acid, have too acid skins, or too acid mouths is now a prevalent idea, due in part to the realization that some of the foods we eat are acid or have an acid ash, or alkaline, with alkaline ash. This idea is not founded on facts. If we are eating a diet within the wide range of normal, it is almost impossible to develop acidosis, so remarkable is the body's mechanism for maintaining the blood and tissues at a constant and almost neutral reaction. The sodium of the body and the calcium of the bone constitute huge reservoirs of alkaline material that can be drawn on to neutralize excess of acidity, and the carbon dioxide of the breath, together with the urine, represent methods of excreting excess acid.

Other diseases of metabolism are lipomatosis. This is a condition due in part to or characterized by the inability of the body to properly metabolize fat. As a result, fat is deposited in queer ways, some innocuous, some painful or disabling. One may find one large fatty tumor, or numberless small fatty tumors, or enormous deposits of fat between muscles, or enormous obesity. The cause is not known.

Another disease is hemochromatosis—a disease thought by some to be due to faulty iron metabolism, for iron is deposited in the skin, liver, or any other organ. This is one of its chief characteristics, but it is frequently accompanied by diabetes and by cirrhosis of the liver, and by pigment deposits in the skin.

It is obvious that the maintenance of health is a most complex procedure. To manufacture muscle, bone and nerve we must have food. The process of turning this food into body tissue constitutes metabolism. But we must have proper food, food with adequate minerals and adequate vitamins, or body tissues suffer —nerve, muscle, skin, eye, gland. Abnormal glandular activity may affect the utilization of food, as does lack of mineral or vitamin. Heat, cold and emotion affect our metabolism, our need or use of food. Yet over the centuries man has groped in ignorance, by instinct, by trial and error, and has survived. Now we can perhaps see more clearly why he has fought his neighbors for possession of green pastures, water hole, or sunny lands, why he has craved salt, why he has so craved protein that he became cannabalistic, why he has drunk blood in the Arctic to cure night blindness or eaten the contents of the stomach of the walrus to secure the green algae in it, why the fishermen in the barren Hebrides ate the liver and heads of fish, or why starvation in France caused the French Revolution. Instinctive craving has played its part in this struggle for survival. It is doing so in the world today. Yet we are often careless about our food, the basis for proper metabolism, little realizing that our health and strength still depend on an intelligent search for the correct food.

Convalescent Poliomyelitis Cases

Moving Picture Demonstration of Their Examination, Protection, and Treatment

Maude W. Baum

Reel A

The first reel introduces the principles of rest and protection in the aftercare of poliomyelitis cases. Emphasis is placed on the fact that when muscles are weak, the joints over which these muscles act are not permitted full range of motion because of the danger of stretching the weak muscles. The necessity of protecting the patient against free joint motion is important not only through use of casts but through care in the method of handling the patient during nursing or physical therapy treatment of the child.

The neutral or ideal rest position in which to place a *new* poliomyelitis patient is pictured in detail. For all muscles, this is a position of physiological rest. Briefly, body supine, shoulders at seventy-five degrees abduction, elbows at right angles, forearms midway between supination and pronation, wrists slightly extended, fingers relaxed in the position as described by a normal hand dropped at the side, with thumb in position of abduction from palm toward front of wrist making a "U" with the index finger. Hips are in extension and in about thirty degrees abduction, neutral between external and internal rotation, knees flexed about fifteen degrees, feet at right angles, and toes straight. The body is shown in improvised protection with pillows and blankets, in adequate protection with splints, and in more ideal protection with casts and braces.

Reels B and C

The second and third reels show muscle tests in detail, starting with respiratory and facial muscles, toe, foot, and leg muscles and progressing to the hand, arm, neck, back, and abdominal muscles. In most of the tests, the same muscle on the normal extremity is tested to show the comparison with the weak muscle. In some instances modifications of the regular tests are shown, as, for example, modifications of tests for scapular muscles when the shoulder muscles are too weak to use the arm in the routine test movement for the scapular muscle. It is made obvious throughout the testing that care is taken in handling the patient and that muscles are not allowed to be tested at the expense of stretching other muscles. The necessity for accuracy in isolation of muscles rather than merely performance of movement is brought out especially in the gluteus medius and anterior abdominal tests.

Reel D

This reel is devoted to pictures of braces and casts used in detailed protection of muscles. Leg braces with the various types of locks at the ankle and knee are shown with a description of the muscles each protects. Pictures of an adjustable arm abduction brace show its uses and show how it accommodates for detailed protection of arm and shoulder muscles.

Accurate muscle testing must precede application of casts or other forms of protection as shown by the next pictures in this reel. The muscles of the hand are carefully examined before applying a protective support. It is also shown by these pictures that the patient is allowed as much freedom of motion as possible along with maximum protection.

This reel also shows a small thigh abduction support, a leg cast held in abduction, and a hip support which stabilizes the hip to prevent undue strain on abductors.

A series of pictures is devoted to protection of abdominal muscles through use of moleskin, corsets and braces.

Reel E

The last reel outlines the types of treatment used and the principles involved in treatment. Briefly these principles are:

1) Protection—by support, and by restriction of range of joint motion.

Synopsis of movie shown at the American Physiotherapy Association Convention in Boston, Massachusetts, June 1938.
Produced at the Children's Hospital School, Baltimore, Maryland, by Henry O. Kendall and Florence P. Kendall under the auspices of the Maryland League for Crippled Children.

Department of Education, The William S. Baer School, Baltimore, Maryland.

2) Prevention of fatigue—by graduating the kind and amount of exercise according to muscle strength.
3) Localization of exercise to weak muscles, and starting the movements from neutral position, *not* from positions of stretch.
4) Rule out substitution by further localization of exercises. Underwater activity is briefly shown. The danger of muscle substitution in underwater exercises is emphasized. Walking in the water constitutes the underwater activity permitted. Early cases are not put into the pools. Only those with good (about seventy per cent) strength and balanced musculature permitted to go into the water without braces. When muscle weakness or imbalance exists which can be adequately supported with water braces, functional activity in the water may be permitted.

Services for Crippled Children

Near East Foundation, Athens, Greece

M. Katherine Lorrilliere

Just two years ago Miss Bell Greve spent a few days in Athens telling the Greek people about the work being carried on for cripples in the United States of America. Her words fell on fertile, although dry, soil and grew into the Hellenic Society for Crippled which in turn has kept the interest growing. By dry soil is meant that as much as plants need water in order to grow and produce, work needs funds to keep it from wilting. Greece is a poor country and lacked the financing power. The Near East Foundation of New York City with foreign headquarters in Athens is now trying to raise funds to meet that lack.

The Greek Government and also the Hellenic Society for Crippled Children started first by asking, "How many crippled children are there in and about Athens?" This was a question no one could answer for cripples, being thought of as useless, are kept at home and hidden from the public eye. A few are used as a means of gaining a meager livelihood through begging, but those inquiring knew there must be more.

One year after Miss Greve's visit, a survey conducted by Miss Eugenia Pope of Washington, D. C., was made possible by the Near East Foundation. During the survey 156 children from nine districts of Athens were examined, manifesting handicaps varying in type from blindness to all types of crippling conditions, with infantile paralysis responsible for one-third and bone tuberculosis for another one-third. It is estimated that there are 5,000 cripples in Athens and 25,000 in all of Greece with nothing being done for them beyond hospital bed care.

The poverty in Greece is extreme—some sections are congested as is no place in the States of which I know. Sunshine is about the only element necessary to healthy living which is to be had in abundance. Resistance to disease therefore is lowered, causing the prevalence of tuberculosis, infantile paralysis and malnutrition deformities.

Athens has about sixteen hospitals, one of which is a children's hospital. These serve *all of Greece*, including the many islands and isolated villages. In not one has an orthopedic department been found, although the children's hospital is making plans either for a wing or a separate building which will, without doubt, be kept full to capacity. The staff of the children's hospital is interested in and anxious to cooperate with the Near East Foundation's demonstration of physical therapy, occupational therapy and classes for crippled children which are to be started in Athens.

The three orthopedic physicians in Athens, all of whom have studied in other European countries as well as in Greece, are showing interest in learning the methods used in the

Director, Therapy Center and School for Crippled Children, Near East Foundation, 16 Stadium Street, Athens, Greece.

United States—we being more highly organized in orthopedic work and having pioneered to a greater extent than have most of the European countries. The idea continues to be quite prevalent in Europe, and more especially in the countries of the Near East, that cripples are useless and always will remain useless. This idea gradually is being changed and must be one of the main points to be shown by our demonstration.

The committee of the Hellenic Society for Crippled Children is most enthusiastic and sincerely anxious for the work to progress and are cooperating to the best of their ability under the leadership of the president, Madame Rediades, who recently has had temporarily to give up her office due to the death of her husband, the former Minister of Finance. We are fortunate, however, in having as acting chairman, Madame Korizis, wife of the Minister of Public Health and Welfare, and as the secretary of the committee, Madame Microulakis, who also is sincerely interested in the work.

Treatment for crippled children seemed to be the logical starting point, with physical therapy for those between the ages of six and twelve. Class lessons are based on those offered by the Government schools for children who are unable to attend school because of their physical handicap. In after-school hours we recently have added treatment for school children and younger children who should have such care.

All children pass through a clinic which is under the auspices of the State Center for Pedological Research, working in conjunction with the Hellenic Society for Crippled Children. The three orthopedists each give one hour a week to the clinic and recommend children to us for treatment.

I arrived in Athens on January 16, 1938, and on February 7th we opened our doors to the first three children selected from among those seen at the time of the survey. We all were thrilled—workers and children. The three, between the ages of seven and eight, had the diagnosis of poliomyelitis, two children with leg involvements, and one cerebral palsy (spastic paralysis). One child with infantile paralysis had just received, from the Hellenic Committee, double caliper braces; another needed a single brace, and the third child was unable to stand even with self-support. None of them could count up to five nor read even the simpliest words.

The staff consists of myself, an American physical therapy technician; two Greek women, one of whom is in charge of the education of the children, working very closely with me and who is invaluable as my interpreter; a second woman who performs all orderly service, cooks the children's lunch and does all general chores; and a Greek man who makes the social service investigations and all arrangements for the construction of our equipment.

Special desks and chairs with leg rests, as well as tables, and such necessary equipment, had to be constructed to order and by hand—no rush orders or pieces chosen from beautifully illustrated catalogues. The interest of the carpenters and their wish to produce something to my liking has made the delay less annoying than it otherwise would have been. They have taken my suggestions and worked over them to construct equipment in the most useful and reasonable way. Metals are imported and very expensive soft wood has been used almost exclusively. The necessary thrift of the Greek is enlightening and good for an American to see.

By April we had six children for the combined treatment and lessons five days a week; seven for treatment only, once or twice a week according to the need, and nine applicants awaiting doctors' examination and acceptance or rejection. Others were coming in to apply, having heard of our work. That was gratifying progress.

Our work is set up in two sunny, airy rooms in a building in Athens used by the Working Girls' Center, also established by the Near East Foundation although now operated by a Greek committee. The rooms are used for classes each evening, necessitating the moving of our furniture out of the way and replacing it again in the morning. This continual transformation has been accepted graciously by those who are using the building and we are grateful for these quarters for the start of our program, but both they and we are looking forward to a better arrangement when we may have our own place and they have theirs, undisturbed.

With the keen interest of the committee, of the workers and your interest from home, the work will grow into full blossom and become fruitful for Greece, given the impetus toward life by the International Society for Crippled Children of the United States of America.

The Physiotherapy Review

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The Editorial Board of the REVIEW wishes everyone a Very Happy and Prosperous New Year!

Upon entering a new year it is well to look back over the old and see what has been accomplished and what there is left for us to work for in the coming year. As we look back not only to 1938 but to the years preceding we find that much has been accomplished which affects each one of us as an individual. The position we hold today and the respect which the members of the American Physiotherapy Association enjoy from the medical profession and from allied groups has not just happened. It has been built up over a period of years by individual members working in the interests of the Association and by the executive committees charged with the responsibilities of the Association.

The Association is constantly on the alert, through its Legislative Committee, to prevent the passing of laws which would be detrimental to the interests of its members. We no longer have to be licensed as beauty parlor operators, as was the situation in one state, in order to follow our profession.

The present high standards of education also did not just happen — today they are taken for granted, but many of us remember the long struggle to raise those standards. Hospitals, physicians and departments of education have come to the realization that a technician who does not meet these educational requirements cannot serve them or their patients to the fullest extent. An individual with training in only one branch of physical therapy, as was formerly the practice, has no place today. Specialization in any one branch should follow the completion of a general course in physical therapy. The progress of the Association may be analagous to a chronic patient who has been receiving physical therapy for some time and who questions his or her improvement. It often is necessary to explain to the patient to look back a period and recall his or her condition as it was before treatment started and the improvement then readily can be seen.

It is only in retrospect that we can appreciate what the American Physiotherapy Association has accomplished, yet there is just as much ahead to be done. An individual working alone cannot make much progress but working together as a group we are able to progress and to make the standards of the individual even higher. The same is true again as in our work, it is not our treatment alone which is responsible for the patient's making progress and getting well. It is the combined efforts of the physician, the physical therapist, the nurse, the teacher and the bracemaker.

Looking ahead we see a constantly enlarging field for the physical therapy technician. The great development for work with crippled children through the Social Security Act has increased our field and our responsibilities. The American Physiotherapy Association is proud to have been of service in aiding the Children's Bureau to advise states regarding the establishment of standards for physical therapy technicians. This has had a far-reaching effect, for in many states physical therapy was entirely unknown. In many instances the demand has exceeded the supply and had it not been that standards had been firmly established, many inadequately trained workers would have been in this field.

The standards of our profession and the advantages under which we as individuals work today are the result of the efforts of our Association. Let us resolve to continue to work tirelessly for the benefit of our profession so that the next decade will show even more development and progress than the one just past.

Eighteenth Annual Convention

The Colorado Chapter sincerely hopes that as many as possible will attend the 1939 National Convention to be held at the Hotel Cosmopolitan, Denver, Colorado, from June 25th to 30th inclusive. Our tentative program includes the following:

Physical therapy in thoracoplasties
Physical therapy in arthritis
Physical therapy in psychiatry
Physical therapy in fever therapy
Diathermy in pelvic disorders
Role of physical therapy in the new Social Security program
Orthopedic lectures with clinical demonstrations
Round-table discussion on the teaching problems in physical therapy.

Besides the banquet there will be an evening at the theatre in the well known Elitch's Gardens, and also other attractions.

Colorado mountains offer many interesting trips, such as Pike's Peak, Garden of the Gods, the Trail Ridge Road from Estes Park over the Continental Divide to Grand Lake, the Mount Evans trip via Echo Lake and Summit Lake which is above timberline, and short trips to the nearer mountains.

Come and see the Rockies while attending the 1939 National Convention!

HOSTESS CHAPTER

Scientific Exhibits

The executive committee is offering two prizes of fifty dollars and seventy-five dollars respectively for the best amateur and professional exhibits at our coming convention in June. Amateur class includes chapter assistance only; professional includes paid professional assistance in planning the exhibit. Each exhibit should be built around a central theme, that is, develop one subject completely, each chapter to make their own selection of subject matter. Winning exhibits will become the property of the American Physiotherapy Association to be used as exhibit material for other meetings and conventions.

Notice of your tentative plans should be filed with Miss Helen Foss, Publicity Chairman, Children's Hospital, Iowa City, Iowa, not later than April 15th.

Mr. Schwait, president of the Texas Chapter, was in charge of the exhibit shown at the American Hospital Association meeting in Dallas, Texas, September 1938. Posters explaining the standards of our organization and the components of physical therapy were hung to form a background for the miniature physical therapy department consisting of a waiting room, a gymnasium, a treatment room and a hydrotherapy room. The posters originally had been made and exhibited by the Chicago and Wisconsin Chapters and were loaned to the American Physiotherapy Association for this exhibit. The miniature physical therapy department was assembled in Cleveland. The remainder of the exhibit was arranged by Mr. Schwait, who wrote that the exhibit received very high praise from the doctors and superintendents of the different hospitals in Dallas. He has been requested to duplicate the miniature physical therapy department exhibit and set it up for various medical conventions in Texas.

The exhibit showing the history and development of physical therapy, which was exhibited by the Chicago Chapter at the American Physiotherapy Association convention in 1938, was shown at the meeting of the American Academy of Physical Medicine in Washington, D. C., October 24 to 26. Mrs. Frieda Gassin, representing the District of Columbia Chapter, was in charge of the exhibit at this meeting and reports that it attracted considerable attention.

This exhibit, originally prepared by the Chicago Chapter and including photographs collected and loaned by Dr. John S. Coulter, is to be retained in the permanent collection of the American Physiotherapy Association. It is excellent material and is available to chapters for local or state physical therapy or medical meetings.

Chartered Society of Massage and Medical Gymnastics

As a delegate to the Annual Congress of the Chartered Society of Massage and Medical Gymnastics, in London, September 19-23, 1938, I found their convention not so different from our own annual affair.

The Sherry Party on the second day, instead of an "Opening Tea," was a delightful place to become acquainted. There we met Doctor and Mrs. Mennell, and they gave the two Americans a cordial welcome. We were sorry not to see Mrs. Mennell again, but enjoyed

Doctor Mennell's class one morning at the St. Thomas' Hospital.

I think the most helpful feature of the meetings was the practical classes given. Miss Pratt has evolved a special technique for the treatment of nasal catarrh by massage. She demonstrated it on each one in the class and we practiced. A small fee was charged and each class was well attended.

The unity between the medical profession and the members of the Chartered Society of Massage and Medical Gymnastics was noticeable. If a physician finds there is no member of the Society in or near his community, he often notifies the Society, and before long a member is established in private practice in this particular community. Private practice is much more common in England than in the United States.

The exchange of positions between our organizations is proving satisfactory to all, I learned, and eventually should lead to reciprocity. Mrs. Young, Secretary of the Society, tells me this can be done but it will take time to evaluate the course of study from each one of the approved schools.

Some special work for children with bronchial asthma is being carried on by Miss Pollard in the physical therapy department at St. Thomas' Hospital. Treatment by infrared radiation is followed first by breathing exercises and later by carefully graded exercises. The results thus far are encouraging—many of the children have less frequent attacks. Patients begin breathing exercises the second day following a thorocoplasty.

At the exhibition the book section was the most popular. A representative of one of the oldest medical book supply companies was present to answer inquiries and to take orders. Electrotherapy equipment of various types was on display.

The annual dinner gave us the opportunity of enjoying an English custom—the toasts to the King, the Queen, and the Royal Family. During Doctor Mennell's remarks he mentioned the presence of the two American Physiotherapy Association members as well as other guests.

Since the papers will appear in the Society's publication, I will not give them in detail. They were similar to those given at our conventions.

HELEN S. FOSS

Examination for Membership

The next examination for applicants with irregular preparation who may desire membership in the American Physiotherapy Association probably will be given during the week of March 20. December 31 was the closing date for receiving applications for the March examination.

The closing date for the acceptance of applications for the final membership examination must be submitted before June 1, 1939. Any individuals with irregular training wishing to avail themselves of American Physiotherapy Association membership should submit application before that date. If found eligible, their names will be listed for the closing examination to be given in the fall of 1939.

District of Columbia Chapter

Laura Sansbury was invited by the Southern Maryland Medical Society to address them concerning physical therapy at their recent meeting at Solomon's Island. Miss Sansbury gave a history of our Association and its cooperation with the American Medical Association and described the work we are doing.

The American Academy of Physical Medicine met at the Willard Hotel in Washington on October 24 to 26. The members of the Academy visited the physical therapy department at Walter Reed Hospital where Miss Vogel presented a clinic. Following a lecture on hydrotherapy in mental conditions, a visit was made to St. Elizabeth's Hospital, the physical therapy department being especially interesting.

The District of Columbia Chapter held its Christmas meeting in St. Elizabeth's Hospital, at which time Dr. Winifred Richmond, Chief Psychologist, gave a very interesting lecture. St. Elizabeth's, a mental hospital under the Department of Interior, accommodates about 6,000 patients and has a very well equipped physical therapy department.

Santa Barbara Chapter

On November 17th the Santa Barbara Chapter entertained the Southern California Chapter with a buffet supper in the library of the Santa Barbara Clinic. Reports and discussions followed the supper.

Index to Current Literature

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Miss Kenny's Treatment of Poliomyelitis. Jour. Char. Soc. M. & M. Gym., Dec. 1938.

Infantile Paralysis—Results of Miss Kenny's Treatment. Jour. Char. Soc. M. & M. Gym., Dec. 1938.

Arthritis and Rheumatism

Occupational Therapy in the Treatment of Arthritis. W. S. C. Copeman, M. D. Brit. J. Phys. Med., Oct. 1938.

Rheumatism and Electrotherapy. William Beaumont. Brit. J. Phys. Med., Oct. 1938.

Chronic Arthritis in Women. C. A. Robinson, M. B., and V. C. Robinson, M. B. Brit. J. Phys. Med., Oct. 1938.

Fascial Adhesions in Pain Low in the Back and Arthritis. Charles Murray Gratz, M. D. Jour. A. M. A., Nov. 12, 1938.

The Treatment of Rheumatoid Arthritis with Large Doses of Vitamin D. Nathan R. Abrams, M. D., and Walter Bauer, M. D. Jour. A. M. A., Oct. 29, 1938.

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Diathermy and Hypertensive Retinitis. Queries and Minor Notes. Jour. A. M. A., Sept. 10, 1938.

Technical Problems of Short Wave Diathermy—Evaluation of Wavelength, Dosage, Technic. Norman Edwin Titus, M. D. Arch. P. T., Nov. 1938.

Power Measurements of Diathermy Apparatus. Howard A. Carter, B. S. in M. E. Arch. P. T., Nov. 1938.

Dosage Measurement in Short Wave Diathermy. Eugen Mittelmann and Disraeli Kobak, M. D. Arch. P. T., Dec. 1938.

Physical Characteristics of Short Wave Diathermy. Allen Hemingway, Ph. D., and K. W. Stenstrom, Ph. D. Jour. A. M. A., Dec. 17, 1938.

The Rotating Electrode for Short-Wave Therapy. J. P. P. Stock, M. D., and C. R. Burch, B. A. Brit. J. Phys. Med., Dec. 1938.

Electrotherapy

Rheumatism and Electrotherapy. William Beaumont. Brit. J. Phys. Med., Oct. 1938.

Electrocoagulation of Four Hundred Cervical Erosions—A Photographic Study. Otillie Zelezny-Baumrucker, M. D., and George O. Baumrucker, M. D. Surg., Gynec. & Obst., July 1938.

Electrolysis. Anthony C. Cipollaro, M. D. Jour. A. M. A., Dec. 31, 1938.

The Treatment of Recent Injuries by the Faradic Current. Sir Morton Smart. Jour. Char. Soc. M. & M. Gym., Dec. 1938.

A Comparison of the End-Results of Treatment of Endocervicitis by Electrophysical Methods: Cautery, Coagulation and Conization. Adolph Jacoby, M. D. Amer. J. Obst. and Gynec., Oct. 1938.

Conization of Cervix. Surg., Gynec. & Obst., Sept. 1938.

Exercise

The Anatomy of Movement. Professor D. M. Blair, M. B., D. Sc. Jour. Char. Soc. M. & M. Gym., Nov. 1938.

Exercise During the Menstrual Period. Alice E. Sanderson Clow, M. D. Jour. Char. Soc. M. & M. Gym., Dec. 1938.

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Diathermy and Hypertensive Retinitis. Queries and Minor Notes. Jour. A. M. A., Sept. 10, 1938.

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Hyperpyrexia Produced by the Hot Box in Combination with the Elliott Treatment. W. Spencer Gurnee, M. D. Am. J. Obst. & Gynec., Sept. 1938.

Psychiatric Aspects of Artificial Fever Therapy. Current Comment. Jour. A. M. A., Sept. 17, 1938.

Fever Therapy at High Humidities. William Finkelstein, M. D. Arch. P. T., Dec. 1938.

Fever Therapy. Wm. Gardiner, M. D. Canadian J. Occup. Ther. & Physio., Oct. 1938.

Injuries

Treatment of Fracture-Dislocation of the Spine Associated with Cord Injury. Claude C. Coleman, M. D., and J. M. Meredith, M. D. Jour. A. M. A., Dec. 10, 1938.

The Treatment of Recent Injuries by the Faradic Current. Sir Morton Smart. Jour. Char. Soc. M. & M. Gym., Dec. 1938.

Suspension Methods in the Treatment of Peripheral and Back Injuries and Certain Nervous Diseases. MISS R. SHILTON and MISS M. G. FINLEY. Canadian J. Occup. Ther. & Physio., Oct. 1938.

MISCELLANEOUS

Daylight in Relation to Climate and Health. W. R. G. ATKINS. Brit. Med. J., Sept. 10, 1938.

Infra-Red Photography of the Abdominal Wall in Portal Cirrhosis of the Liver. I. R. JANKELSON, M. D., and HENRY BAKER. Amer. J. Digestive Dis., Sept. 1938.

Diseases of the Skin. JOHN T. INGRAM, M. D. Practitioner, Oct. 1938.

The Influence of Clothing on the Physiological Reactions of the Human Body to Varying Environmental Temperatures. A. P. GAGGE, C.-E. A. WINSLOW and L. P. HERRINGTON. Amer. J. Physiol., Oct. 1, 1938.

Chronic Synovitis of Knee Joint Treated by Synovectomy. GEORGE A. L. INGE, M. D. Jour. A. M. A., Dec. 31, 1938.

Passive Vascular Exercise. R. C. BURR, M. D. Canadian J. Occup. Ther. & Physio., Oct. 1938.

The Effect of Heat on the Blood Volume and Circulation. H. C. BAZETT, M. D. Jour. A. M. A., Nov. 12, 1938.

NERVOUS AND MENTAL DISEASES

Cerebral Palsy. WINTHROP MORGAN PHELPS, M. D. Public Health Nurs., Jan. 1939.

Suspension Methods in the Treatment of Peripheral and Back Injuries and Certain Nervous Diseases. MISS R. SHILTON and MISS M. G. FINLEY. Canadian J. Occup. Ther. & Physio., Oct. 1938.

OCCUPATIONAL THERAPY

Occupational Therapy. JOSEPH E. RAYCROFT, M. D. Hospitals, Sept. 1938.

Occupational Therapy in the Treatment of Arthritis. W. S. C. COPEMAN, M. D. Brit. J. Phys. Med., Oct. 1938.

ORTHOPEDICS

The Orthopedic Public Health Nurse. ALICE FITZ GERALD. Public Health Nurs., Nov. 1938.

Physiotherapy and Orthopedics. Part I. W. SAYLE CREER, M. CH. Brit. J. Phys. Med., Dec. 1938.

What Is Orthopedic Nursing? JESSIE L. STEVENSON. Amer. Jour. Nursing, Jan. 1939.

PHYSICAL THERAPY

Physical Therapy in Rural Practice. HAROLD J. HARRIS, M. D. Arch. P. T., Nov. 1938.

Physiotherapy and Orthopedics. Part I. W. SAYLE CREER, M. CH. Brit. J. Phys. Med., Dec. 1938.

RADIATION

The Relative Influence of Radiation and Convection upon the Temperature Regulation of the Clothed Body. C.-E. A. WINSLOW, L. P. HERRINGTON, and A. P. GAGGE. Amer. J. Physiol., Oct. 1, 1938.

The Origin of the Erythema Curve and the Pharmacological Action of Ultra-Violet Radiation. J. S. MITCHELL. Proc. Royal Society, Series B., Oct. 1938.

Analysis of Experimental Production of Bifid Tails by Ultraviolet Irradiation. I. D. BARONOFSKY and A. M. SCHECHTMAN. Proc. Soc. Exp. Biol. and Med., Oct. 1938.

Effect of Light on Uptake of Water by Frogs Injected with Posterior Pituitary Extract. ELDON M. BOYD and AUSTIN E. SMITH. Proc. Soc. Exp. Biol. and Med., Oct. 1938.

The Ultraviolet Ray as an Eye Hazard. VAN D. RATHGEBER, M. D. Texas State J. Med., Oct. 1938.

The Physiological Effects of Ultraviolet Radiation. HENRY LAURENS, PH. D. Jour. A. M. A., Dec. 24, 1938.

REHABILITATION

Rehabilitation of the Physically Handicapped. HENRY H. KESSLER, M. D. Arch. P. T., Dec. 1938.

Special Classes for Crippled Children. Affirmative—MARGUERITE LISON INGRAM. *Negative*—R. C. THOMPSON. The Crippled Child, Dec. 1938.

Preparing the Handicapped Child to Live. MAY E. BRYNE. Public Health Nurs., Dec. 1938.

Guide to the Literature on the Handicapped Child. Jour. Excep. Children, Nov. 1938.

Federal Aid for the Education of the Handicapped. Jour. Excep. Children, Nov. 1938.

The Opportunities of Special Education. Jour. Excep. Children, Nov. 1938.

Training of Teachers for Orthopedic Classes. Jour. Excep. Children, Dec. 1938.

The Question of Rehabilitation. ELIZABETH HULL. Canadian J. Occup. Ther. & Physio., Oct. 1938.

ABSTRACTS

John S. Coulter, M. D.

The Uses and Abuses of Ultraviolet Radiation

Albert Eidinow, M.B., B.S., M.R.C.S., L.R.C.P. In the Practitioner, CXLI:2:154, August 1938.

Indications for Use

General light treatment is of value in promoting calcium metabolism, increasing blood resistance and capillary circulation. General improvement in health and metabolism will result from the combined effect of the exposure to open air and sun. The continued exposure to the bright luminous rays stimulates blood regeneration, but excessive heating must be avoided. Local erythema reaction of the skin produced by ultraviolet rays affords a method for counterirritation of the skin. Ten to fifteen full erythema doses can be applied to the normal white skin, and provided that this irradiated area is kept covered by adhesive strapping for fourteen days, the patient does not suffer undue pain or discomfort. Such method of counterirritation treatment can be employed in the treatment of painful neuralgia, neuritis and fibrositis as seen in sciatica, acute lumbago, cervical fibrositis, and brachial neuritis. Effusion of joints and tissues following injury or active inflammation can be aided by such measures.

Local treatment of inflammatory lesions is similar to methods of counterirritation therapy. Such local treatment aims at augmenting blood supply and hastening resolution and repair of inflammation. Acceleration of formation and separation of sloughs and granulations follow. In addition to the counterirritation reaction, ultraviolet rays have a surface bactericidal action and they also augment bactericidal agents at the site of irradiation. The treatment of varicose ulcers, chronic ulcerated wounds, radium burns, tuberculous ulceration of skin and glands indicates the value of local treatment with ultraviolet rays by massive erythema-producing doses. Local treatment fails when it is difficult to cause skin erythema reaction or stimulate the local circulation which will remain for some weeks. Incorrect technique may make the tissues immune to irradiation.

Faulty Technique

Patients who are suffering from tuberculous disease of the lung must be cautious when exposed to light. There is danger that prolonged exposure to the heat of the carbon arc or the sun will cause toxemia. Exposure of the whole body surface to a quartz mercury-vapour lamp has excited latent lesions in the lung or has produced a sudden hemoptysis. Such active symptoms have been recorded and have been cited as reasons for the contraindications of light therapy. However, if care be taken (that is, the heating controlled and the surface area-dosage supervised), ultraviolet rays can be successfully employed in the treatment of lung disease. It is advisable to warn all patients who have active lung disease, especially if they are fair skinned with poor capacity for pigment production.

Unfortunately many qualified practitioners do not know how to prescribe light therapy and leave treatment to the nurses, masseuses, and technicians. It is doubtful if such measures are wise, for the use of weak doses of rays frequently is of little value and the prescription of maximal doses needs expert knowledge and supervision. Light therapy is much abused in this manner, for nurses employ the weak doses advertised for the sake of safety, as they rightly feel it is beyond their capacity to prescribe the stronger doses causing full erythema reactions. The ideal method is one in which the general practitioner refers his patient to the expert in physical medicine who will prescribe the treatment necessary to be carried out by nurses. Such treatment should be continued under his supervision, for difficulties may arise when repeated daily applications of weak doses of ultraviolet rays are applied to the site of a lesion. The blood supplied can be further stimulated into an active phase of dilatation by the addition of luminous and short infrared rays daily.

Vascular Diseases

A review of some of the recent literature, with a critical review of the surgical treatment. George W. Scupham, M.D., Geza de Takats, M.D., Theodore R. Van Dellen, M.D., and William C. Beck, M.D. In Archives of Internal Medicine, 62:3:482, September 1938.

Kling and Sashin used histamine iontophoresis in a large group of cases of Raynaud's disease, acroparesthesia, angioneurotic edema and thrombo-angiitis obliterans. Relief from pain was obtained in 60 per cent of his cases. Solution of histamine prepared in a dilution of 1:2,000 was found to be most beneficial. He considers histamine superior to mecholyl (acetyl-beta-methyl-choline chloride) because it has more effect on the arterioles and capillaries, with fewer systemic reactions. Murphy, using mecholyl iontophoresis, noted definite improvement in 31 of his 33 cases of thrombophlebitis. Edema subsided, and the patient was able to be up and about without the aid of a supporting bandage.

Allen and McKechnie, using a sphygmomanometric cuff above or below the knee, thus producing intermittent venous occlusion, were not able to produce any evidence of significant or consistent vasodilatation, as measured by the cutaneous temperature. Under basal conditions they studied a group of 19 patients with or without peripheral vascular disturbances. The fact that the final temperature of the skin in individual cases did not vary within a degree either above or below the original level was significant to them, in that vasodilatation did not take place. The Council on Physical Therapy, however, in a preliminary report, states that tests indicate that both the cutaneous temperature and the oscillometric curves increase after the application of the Collens-Wilensky appartus. It was also noted that during venous occlusion there was a filling and stretching of the venocapillary bed and during release reactive hyperemia took place which brought on vasodilatation. It was noted, however, that no provision is made in this type of treatment for emptying the vascular bed effectively, and for this reason a certain amount of continuous venous stasis exists. Kramer, de Takats, Hick and Coulter are in agreement with this report. Kramer in a study of 30 cases confirms the work of Collens and Wilensky. In 66.6 per cent of the cases definite benefit was obtained. Cramps were relieved in 77.7 per cent, fatigue in 83.3 per cent and pain in only 56 per cent, a figure considerably below that given by Collens and Wilensky. Although Kramer was unable to make complete studies, he did find an average increase in the oscillometric readings.

De Takats, Hick and Coulter adopted a triphasic cycle, consisting of (1) elevation of the leg, (2) venous compression while the leg is still elevated and (3) lowering of the leg to a horizontal position, followed by release of the compression. Venous hyperemia was obtained by the use of an ordinary sphygmomanometer, the cuff of which was 8 inches (29 centimeters) wide. They were able to show that intermittent venous hyperemia in a normal person increased the oscillometric readings during the venous constriction, with further increase immediately after release. The systolic and diastolic blood pressures during the period of constriction remained unchanged but decreased immediately after release of the constrictor. When vessel spasm was released either by placing the extremities under a heat cradle or by sympathectomy, the results were similar. Less striking finds were obtained in patients suffering from arterial disease. A rest period after compression was advocated in order to prevent a refractory stage. The passive elevation of the extremity allowed the venocapillary bed to empty sufficiently. The necessity for the two last-mentioned procedures was demonstrated by measuring the oxygen content and saturation of the blood from the femoral vein draining the treated extremity. Oxygen saturation was found to be fairly well maintained. These authors conclude that the mechanism involved is a mechanical filling and stretching of the vascular tree because of compression. After release a chemical vasodilatation takes place as a result of an oxygen debt, thus affecting the capillary pressure, the lymph flow and the saturation of the tissues and venous blood with oxygen.

The practical aspect of their study resulted in a simple, inexpensive method of producing intermittent venous hyperemia by utilizing the afore-mentioned triphasic cycle. A sphygmomanometer with an 8-inch cuff is inflated by the patient or an attendant. The amount of pressure varies between 60 and 90 mm. of mercury, never exceeding the diastolic pressure. In cases of edema, cyanosis, ulceration or gangrene, 40 millimeters of mercury is considered maximum at the beginning. The

duration of compression depends on the appearance of definite rubor, usually within one or two minutes. The duration of release always exceeds the period of compression, usually being twice as long. During the rest period, one minute is always allowed for elevation. Treatments are given twice daily for periods of thirty minutes. Ten cases of obliterative vascular disease were studied. Improvement in coldness and numbness was noted in five patients, seven patients were able to walk farther before claudication developed and rest pain was relieved in four patients.

Recently de Takats reported his observations on 50 patients who had had fifty treatments or more. He noted that coldness and numbness were the first symptoms to be relieved. Intermittent claudication improved slowly. Rest pain was the last to be relieved. This he explains by the fact that rest pain is a sign of serious circulatory damage and is found in persons with little ability to form a collateral circulation. Pure vasospastic circulatory disorders were not influenced. If the pressure in the cuff is lowered, this form of therapy can be used on patients with chronic edema, lymph stasis or chronic ulcerations. Phlebitis, lymphangitis and spreading infections are listed as contraindications to this form of therapy.

Confirmatory reports are also made by Brown and Arnott, who limited their study to cases of obliterative vascular disease. Thirteen cases are reported and good results were noted in all except one case. Nocturnal pain was invariably relieved, in some instances within a few hours after treatment was started. Intermittent claudication, present in 10 of the cases, was relieved in all except two. Six of the patients had varying amounts of gangrene, and healing was promoted in all except one. The same authors, in a preliminary report, describe three new types of apparatus for use in the intermittent filling of the cuff. Two of these machines are electric air pumps, while the other is a water pump. Wilson and Ogston describe clearly a novel apparatus for intermittent venous occlusion, utilizing water pressure and siphonage to obtain desired pressure and release in the cuff. Using this apparatus they obtained good results in 10 patients suffering from claudication and gangrene. In this series the rest period was lengthened to four minutes.

Malpractice: Burns Attributed to Faulty Adjustment of Therapeutic Lamp

From the Bureau of Legal Medicine and Legislation, Jour. A.M.A., 111:15:1406, October 8, 1938.

The plaintiffs, husband and wife, sued the defendant, a physician, for burns sustained by the wife during a heat treatment administered by a nurse in the defendant's office. The trial court gave judgment for the defendant and the plaintiffs appealed to the Supreme Court of Washington.

The complaint alleged that the nurse negligently permitted a hot lamp to come in contact with the patient's back by failing to keep proper control over the device. From the evidence it appeared that when the patient called at the defendant's office for a treatment she had with her her six year old daughter, who at the request of the patient remained in the room while the treatment was being administered. In subjecting the patient's body to the heat, a lamp, to which was attached a cord plugged into an electric light socket, was moved back and forth over the patient's body. The patient testified that, at the time she was burned, the nurse had been regulating the heat and had treated her for some time. Finally the nurse pulled the electric plug from the socket but continued distributing the heat from the lamp over the patient's body. While she was so engaged, according to the patient's testimony, the office telephone bell rang and the nurse placed the lamp on some portion of the appliance and started to leave the room. As she was going out, the hot lamp dropped on the patient's back, inflicting the burns. The nurse, on the other hand, seemed to place the blame for the accident on the patient's little girl. The girl, however, testified that she had not touched the lamp and that when the accident occurred she was sitting in a chair reading a book. The patient also testified that the child did not touch the lamp.

The Supreme Court said that nowhere was it alleged that the defendant's negligence consisted of failing to watch the patient's six year old child and prevent the child from injuring her mother. The plaintiffs' theory of the case was that the nurse made some adjustment in the lamp and started to leave the room and that, because the device was improperly adjusted, the lamp dropped on the patient's back. If the plaintiffs desired, the court continued, to adopt as an alternative

theory the story told by the nurse and then contend, contrary to her complaint and all of the testimony introduced in support of her case, that the child had upset the lamp, and that nevertheless the defendant was still liable for negligence on the nurse's part in not restraining the child, certainly the plaintiffs should have asked for a supplementary or qualifying instruction properly presenting this theory of liability on the part of the defendant. Instead of so asking, the plaintiffs simply excepted to the instructions given. Furthermore, it was admitted that the young child was taken into the room where the treatment was administered, at the request of one of the plaintiffs, the patient. The defendant had provided a place for the children of his patients, but the patient, as she testified, was nervous and wanted the child with her. Generally speaking, then, the plaintiffs could not base any claims against the defendant on the act of their own child. If because of the facts of this particular case a different rule might apply, the burden rested on the plaintiffs to see to it that such a question was submitted to the jury under proper instructions. Clearly from the evidence it could not be held, as a matter of law, that the defendant's nurse was responsible for the acts of the child.

The Supreme Court could find no error in the record, and the judgment of the trial court for the defendant was affirmed.

New Type of "Jacket" Respirator for the Treatment of Poliomyelitis

Aubrey F. Burstall, D.Sc., M.E.Mech.E. In Brit. Med. Jour., No. 4054, September 17, 1938.

The jacket type of respirator appears to have the following general advantages over the cabinet type:

1. Simplicity of nursing, panning, etc.
2. Limbs can be treated while the patient is in the respirator.
3. Useful but limited movements of hands and arms are possible if the patient is not completely paralyzed.
4. There is a wider range of vision for the patient.
5. An ordinary bed can be used.
6. The whole jacket can be sterilized.
7. The initial cost is small.
8. The air capacity is much less.
9. It is easier to maintain the temperature of the extremities.
10. It is particularly valuable when the deltoid muscles are paralyzed.

Experience with the jacket respirators which have been used up to the present reveals the following disadvantages:

1. The time taken to install the patient in the respirator is longer than in the cabinet type.
2. At least three sizes of the respirator are required.
3. To raise the arms over the head may cause the patient some distress, and in certain cases may make it impossible for this respirator to be used.
4. There are more points where leakages may occur, and more rubber joints to maintain.

Chronic Atrophic Arthritis

H. E. Thompson, M. D., B. L. Wyatt, M. D., F. A. C. P., and R. A. Hicks, M. D., Tucson, Arizona. In Annals of Internal Medicine, 11:10:1792, April 1938.

There has been sufficient interest and study of arthritis to warrant a somewhat detailed report on chronic atrophic arthritis. This terminology is synonymous with Type I, chronic infectious, chronic proliferative, chronic rheumatoid arthritis and arthritis deformans.

TABLE IV

Treatment of Atrophic Arthritis

An ideal treatment plan embraces a composite program directed to the amelioration of the manifestations of a symptomatic and constitutional disease.

I. Prophylactic.
   A. Removal or correction of:
      1. Infectious factors—early treatment or removal of focal infections before symptoms appear.
      2. External factors—avoidance of chilling, damp climates, trauma, etc.
      3. Constitutional factors—proper attention to constitutional inadequacy—conversion of the "arthritic soil" into a "non-arthritic soil" by detailed attention and treatment.

II. Active.
   A. Constitutional.
      1. Treatment or removal of focal infections.
      2. Rest.
      3. Physical therapy.

4. Diet.
5. Transfusions.
6. Heliotherapy.
7. Climatotherapy.

B. Local—Prevention of Deformities.
1. Rest to inflamed joints, either bed rest or by proper orthopedic appliances, or both.
2. Motion—early through painless range to prevent ankylosis, later active exercise to restore muscle tone.

C. Correction of Existing Deformities.
1. Non-operative.
   a. Traction.
   b. Cast wedging.
   c. Turnbuckle and other adjustable splints.
   d. Manipulation.
      (1) With anesthesia.
      (2) Without anesthesia.
2. Operative.
   a. Arthroplasty.
   b. Capsuloplasty.
   c. Tendon lengthening or shortening.
   d. Osteotomy.
   e. Synovectomy.
   f. Arthrodesis, etc.

D. Antigens and Vaccines.

E. Drugs.
1. Non-Toxic.
   a. Salicylates.
   b. Iron.
   c. Rarely opiates (caution).
2. Toxic or of doubtful value.
   a. Gold salts.
   b. Sulphur.
   c. Chaulmoogra oil.
   d. Arsenicals.
   e. Cinchophen and derivatives.
   f. Massive dose of vitamine products.
   g. Colchicine.
   h. Snake venom.
   i. Bee sting extracts, etc.

Rest—Rest, both local and general, is necessary in the treatment of this disease. Nearly all these patients complain of early fatigue. The patients were instructed as to the proper amount of rest during each 24 hours. Activity must be kept within the limits of fatigue. The amount of bed rest is variable. In cases with hot swollen weight-bearing joints the bed rest should be absolute until the inflammation has subsided. This may be a period of weeks or months. The joints are carried through a painless range of motion several times daily. These rest periods are always carried out with the joints in the position of extension and function and maintained in that position by the necessary appliances. Later, graduated activity and exercise may be permitted. There is no one treatment directed to the joints that is as valuable as rest. With it the inflamed joints are kept motionless and the weight bearing and movement trauma entirely eliminated. It is often surprising how well these mentally and physically fatigued patients respond to bed rest. Naturally in some cases only minimal rest is desirable.

Physical Therapy—Nearly all these patients received physical therapy. This includes heat of all types, light, massage, water, mechanical and electrical modalities and other physical agents. These valuable adjuncts to the treatment of atrophic arthritis will not be discussed as there is a wealth of available publications on this subject. Our staff includes two competent physical therapists who work under direct medical supervision. With portable equipment it is possible to treat patients at home as well as at the Clinic.

We have noted in this group little benefit derived from hyperpyrexia (induced by any means). We reserve its use to gonorrheal arthritis where it is extremely valuable.

The judicious use of physical therapy is important. It requires judgment and direction of administration. When so used there appears to be no doubt as to its therapeutic effectiveness.

Heliotherapy and Climatotherapy—Nearly all arthritics of this type are benefited by a warm dry climate such as we have here in the southwest. It constitutes a valuable aid in the treatment of those patients who can spend a sufficient time in such a climate. It is equally true that a few are not benefited.

Heliotherapy was used in the treatment of the majority of these patients. Sun bathing was prescribed at a regular time, with duration and amount of exposure definitely indicated. There are a few contraindications to direct heliotherapy; namely, (1) the presence of fever, (2) the appearance of a general or local reaction and (3) complicating or debilitating conditions, such as active tuberculosis, chronic myocardial disease, general debilitation and old age, etc. In febrile patients it is wise to give no direct heliotherapy but to

utilize the indirect type. In case of a general or local reaction it is well to minimize the time of exposure, eliminate it entirely or to prescribe only indirect heliotherapy. We believe that both climate and sun are valuable agents in treatment.

Relation of the Fascia Lata to Mechanical Disabilities of the Spine

Frank R. Ober, M.D., Boston, Mass. In Surgery, 4:1:21, July 1938.

Treatment: The treatment of mechanical difficulties of the back, which are associated with fascia lata contractures, depends, first, on removing or minimizing the contracture and, second, on securing a return to the normal physiologic position. When the obstruction is removed, exercises should be begun. The exercise dosage depends on the general musculature of the patient, the degree of discomfort present, and the strength of the muscles which maintain the spine in its correct position.

Physical Therapy: Patients who have bad posture or who have pain in the low back due to fascial and muscular contractures should have exercises prescribed which are designed to stretch those shortened structures as follows:

A. The patient stands with his affected side toward a table or some other convenient object, which is about 3 feet in height, so placed that it does not slide.

B. He should be at least 2½ or 3 feet away from the support. He then grasps the edge of the table with his hand.

C. He should then bend his hip laterally toward the table, being careful not to rotate or twist his body or hips, until the body and legs form an arc of a circle. This position must be held for six or eight seconds. The upright position is resumed and the maneuver repeated three or four times.

D. The above exercise should be increased gradually so that in two or three weeks the number of stretches is increased to ten or fifteen twice daily.

E. *This exercise should not be done* if there is pain in the sciatic nerve, since to do so will only increase the pain in the nerve.

The results in many instances have been highly satisfactory and have given relief from low back pain and have improved postures. The stretching exercises must be carried out over a period of several weeks or months or until the contractures have been relieved. When this has occurred, the simple exercises to improve the condition of the muscles that support the spine must next be prescribed. The principal muscles which support the low back are not the erector spinae muscles but are the abdominal and gluteus maximus muscles.

Anterior Poliomyelitis: Orthopedic Management

Joe. A. Freiberg, M.D., F.A.C.S., Cincinnati, Ohio. In the Ohio State Medical Journal, 34:7:794, July 1938.

The Convalescent Stage

Following the disappearance of signs of systemic infection and muscle tenderness the convalescent stage has been reached. At this period a careful and complete muscle examination is made of the entire body, charting each muscle and muscle group on a special chart.

What is ideal treatment? Briefly, protection from stretching and strain of involved muscles, and graduated active and assistive exercises—and the type dependent upon the power of the individual muscle. Electrical stimulation and ordinary exercises, without attention to asymmetrical muscle weakness, are not satisfactory. While muscle training in these cases must be supervised by one specially trained, a physician or preferably a physical therapist, in many instances intelligent members of the family may carry on the muscle training after receiving instruction.

Much has been said and written in recent times about underwater exercising. The only advantage of pool or underwater exercising is the fact that the buoyancy of the water partially eliminates gravity and lessens the weight of the extremity to be moved by the weakened muscle. Poor or inadequate muscle training in a pool is far inferior to adequate training by other means. Two time-tried methods have proved their worth. The first is by placing the limb on a smooth, well-powdered board in such a way that the pull of gravity is eliminated during the exercising of the particular muscle involved. This necessitates the changing of the position of the extremity on the board for different muscles and muscle groups. The second method, popularized by the late Doctor Gaenslen, utilizes simple slings suspended from an overhead frame over the bed, or from some other fixed object, which will allow the extremity to swing freely through the arc in which the involved

muscle contracts. The principle of muscle training, then, is to combine active contraction of the involved muscles with gentle assistance in such a manner that the muscles are not strained or fatigued. The normal muscles are neglected intentionally in this muscle training, excepting that they are protected so that contractures or elongations may not occur.

Throughout the convalescent period the paralyzed or weakened muscles are protected by splints so that they may not become stretched.

The Stage of Reconstruction

This stage of treatment is reached when at least eighteen months have elapsed since the onset of the disease. A careful analysis of the patient is now made, noting types of deformities present, if any, degree of functional impairment, and last but not least a meticulous muscle examination, charting all of the muscles.

As this stage of the treatment should always be carried out by a qualified orthopedic surgeon, no attempt will be made to list the exact method of correcting the many deformities and methods of regaining stability in an unbalanced and unstable extremity. Suffice to say that practically all of the residual deformities and unstable extremities and trunks can be materially and satisfactorily improved by judicious orthopedic operations. Not infrequently plastic procedures on a contractured but weak leg which overcome the deformity, return the extremity to a balanced or stable function so that in spite of weakness the extremity again becomes useful without external braces. By muscle or rather tendon transplanting operations, a deforming and unbalancing muscle may become a useful stabilizing muscle. A severely unbalanced, unstable foot may be made a stable, useful weight-bearing foot by stiffening or fusing certain joints. However, all of the time-tried operations must be specially chosen or modified for the individual case. Occasionally, an operation cannot succeed sufficiently in stabilizing the extremity to allow discarding braces entirely but may permit the use of a simpler and smaller brace.

Physical Therapy for Deep Tissues and Arthritis

Queries and Minor Notes. In Jour. A.M.A., 111:10:960, September 3, 1938.

To the Editor: Which is preferable for the late treatment of injuries to the bones, muscles and ligaments—infrared or short wave diathermy? In the use of the latter, is there any evidence to show deleterious consequence to delicate tissues, such as the eye or brain, in treating, for example, the sinuses? Which is preferable for the treatment of the pain from arthritis? It seems impossible to get anything but a "Scotch verdict" from the textbooks, and I am suspicious of the claims made by the manufacturers.

Clement H. Arnold, M.D.,
Palo Alto, California.

Answer: Any answers to these questions must be of a qualifying nature owing to the great multitude of factors influencing the end results of treatment. Such factors include (1) the individual reaction (iodiosyncrasies of the patient), (2) area to be treated and (3) the dosage.

While all three of these must be considered, it is the third which offers the chief difficulty in physical therapy. The dose depends almost entirely on the method of administration; different technicians differ both in technic and in judgment. X-ray therapy, in which the dosage can be quite accurately controlled, is a striking exception. In short wave diathermy, for example, the dose and the result will in part depend on the amount of current used, the size of and the distance between the electrodes and the spacing between the electrodes; i. e., the distance from the skin and, of course, the time or duration of the treatment. In the case of infrared radiation, the dosage would depend in part on the power of the lamp, the distance from the lamp to the skin, the anatomic structure and depth of the part treated, and the duration.

In the treatment of bones, muscles and ligaments, the choice between infrared radiation or short wave diathermy should perhaps be made on the accessibility of the part to be treated. In case the injury is comparatively superficial, infrared may well be chosen. It is perhaps more economical, easier to manipulate, and above all easier to control and thus less dangerous. Furthermore, the part treated is more easily inspected and may, if desired, be subjected to brief intermittent massage applications during the administration of heat. The effectiveness of the treatment may also be varied by the application of counterirritants, or by wet compresses. The latter may be kept on continuously during the treatment if moist heat is desired. The compress is kept hot by the lamp, and more water

is periodically poured on the cloth to replace that which evaporates. This is an effective method, for example, of keeping a continuous hot boric compress on open wounds.

A second and equally important, if not more important, question is: How much heat should be introduced? Little or no work has been done on this all important problem. The tendency among those interested in physical therapy seems to be to concentrate on means to create higher temperatures and then to evaluate the efficiency of an apparatus on this basis. This is to be regretted, since there appears to be no information available which indicates that it is better to treat a sprained ankle by a temperature of 106 F. than, for example, 102 and 103.

The matter of dosage (temperature and time) is also an open question. The present tendency is, it appears, to treat to the patients' tolerance, but no data are available which tend to support the theory that such intense doses are more desirable than some lesser ones.

There should be no deleterious consequences to delicate tissue, such as the eye or brain, in treating, for example, sinuses by short wave diathermy, provided the dose is kept within safe limits.

There appears to be no generally accepted physical treatment for the pain of arthritis. This is due, no doubt, to the many forms of arthritis and the difficulty of correct diagnosis.

While at present the effects of short wave diathermy are attributed solely to the heat produced, there are present, no doubt, other secondary effects from the current — effects which have not as yet been segregated satisfactorily but which, if once isolated, may prove of therapeutic significance.

Dosage of Ultraviolet Radiation

Foreign Letters. In Jour. A.M.A., 111:14: 1312, October 1, 1938.

Dr. Wucherpfennig's fundamental discussion of the dosage of ultraviolet radiation before the medical society of Munster, Westphalia, was based in part on his own investigation. Even if the practitioner has at his disposal a dosimeter for ultraviolet rays he is still in no position to evaluate accurately the biologic reaction of predilection in the individual case. It is assumed that the dosimeter will register precisely the most important biologic reaction; namely, the erythema. The erythema, however, as has been demonstrated by the author and others, is peculiarly dependent on the sex and age of the patient and the nature of the disorder. Then, too, erythema varies in character according to the region of the body irradiated. Difficulties which cannot be excluded from administration of even the most optimal physical dose may be abolished, however, if the operator gages his therapeutic procedure by the erythema itself, or, as Wucherpfennig calls it, the "erythematous threshold." For practical purposes one may consider this erythematous threshold of the ultraviolet current to be the weakest degree of reddening which is sharply defined against the adjacent unirradiated region within twenty-four hours after irradiation. The roentgen therapy then consists of some ten additional doses of radiation, administered at intervals of one week. Each dose must be about 30 per cent more powerful than the preceding one. This holds true for all ultraviolet current apparatus. The apparatus (for example, the mercury quartz lamp and almost all carbon arc lamps with metallic salt carbons) usually emits a short wave, erythema-producing, ultraviolet ray (an ultraviolet concentration of from 2,800 to 2,400 angstroms). Recent studies of the intermediary metabolism have demonstrated impressively the importance of the mentioned variations up to the average ultraviolet reaction. The investigations, although seemingly of only theoretical worth, have throughout a practical value as well. Cutaneous reactions to the ultraviolet rays produce, according to the degree of their intensity, metabolic processes which may be wholly disparate in character.

Changes in Composition of Sweat During Acclimatization to Heat

D. B. Dill, F. G. Hall and H. T. Edwards, from the Fatigue Laboratory, Harvard University, Boston, and the Zoology Department, Duke University. Am. J. of Physiology, 123:2:412, August 1, 1938.

Summary and Conclusions

The properties of sweat depend on acclimatization, the rate of sweating, inherent characteristics of the individual, and probably other factors. It becomes more dilute with adaptation to hot atmospheres. Its inorganic constituents increase in concentration as sweating becomes more profuse; at the same time, nitrogen excretion diminishes. The susceptibility of some individuals to heat cramps no doubt depends in part on the inability of

their sweat glands to reduce sodium chloride loss to a low level.

Diseases of the Skin

John T. Ingram, M. D., F.R.C.P. In the Practitioner, CXLI:844:475, October 1938.

Treatment

Many potent drugs have been introduced and it is inevitable that they should be used widely, often indiscriminately, and sometimes abused. This is too often followed by a period of neglect before their true place in therapy is evaluated. This swing of the pendulum has been observed in the use of ultraviolet irradiation. Twenty years ago it was recommended as a cure for all ills and then an authoritative body described the measure as of no more value than a mustard plaster. Its indiscriminate abuse by the profession and commercially was followed by a severe neglect of a valuable weapon. Today its useful place in therapy is slowly becoming recognized. Lupus vulgaris and many other forms of tuberculosis cannot be cured, and psoriasis cannot be effectively controlled, without general ultraviolet light therapy. The treatment of a number of other affections is rendered more effective, and cure is more readily attained, by the use of this measure as an adjuvant; among such affections may be mentioned chronic pyogenic infections, the seborrhoeic disorders, including sycosis, associated with malnutrition, chronic forms of alopecia areata, and some gravitational ulcers.

In all these affections except this last the value of light is in its general effect, and results are achieved only by using the measure properly. The whole body must be radiated daily in dosage sufficient to produce a slight reaction. Light applied locally to a lesion, as is done by the hairdresser, is of no value at all except when concentrated as in a Finsen or Kromayer lamp and applied to the affected part under pressure. It is then of value only in lupus vulgaris and some birthmarks (particularly the port-wine stain) and occasionally in alopecia areata.

Changes in the Skin Temperatures of the Extremities Produced by Changes in Posture

Grace M. Roth, Marvin M. D. Williams and Charles Sheard. In the American Journal of Physiology, 124:1:161, Oct. 1938.

Summary

Observations of the effects of posture on the skin temperatures of the toes and fingers were made under environmental conditions which did not produce either great vasoconstriction or great vasodilatation of the extremities but which permitted the fingers and toes to act as the fine adjustors in the control of the dissipation of heat from the body. Under environmental temperatures ranging from 23 to 30 C. (73.4 to 86 F.) with the subjects in the basal metabolic state and free from sweating of the extremities, the skin temperatures of the toes and fingers decreased when the extremities were elevated and increased when the extremities were pendent. When the posture of the body was changed from the horizontal, either voluntarily or when placed in an angular position by means of a tilt-table, the skin temperatures of the toes increased when the body was tilted with the feet downward and vice versa. These results probably are owing to changes in the peripheral circulation as a result of changes in hydrostatic pressure.

Follow-Up Report of 99 Children Who Received Fever Therapy for Chorea

Lucy Porter Sutton, M.D., and Katharine Gray Dodge, M.D., New York. In the J. of Pediatrics, 12:4:490, April 1938.

The purpose in making this analysis was to ascertain whether the course of the rheumatic infection was in any way different in the treated and untreated patients.

The first group is composed of 48 treated and 23 untreated patients whose observation period was one to three years. The second group is 51 treated and 37 untreated observed four to six years.

The most striking differences are the higher percentages of polyarthritis and deaths from heart disease in both periods as to seem insignificant.

Although there is only a small difference in the amount of heart disease in both the treated and untreated patients, the stage of heart disease was considerably more advanced in the untreated than in the treated. This explains the higher proportion of deaths from heart disease among the untreated.

The number of records analyzed is not sufficiently large to warrant conclusions. However, the findings on the patients observed one to three years and four to six years are very similar and for that reason we think may be of some significance.

The Effects of Prolonged Muscular Exercise On the Metabolism

J. N. Mills, from the Physiological Laboratory, Oxford. In the J. of Physiology, 93: 2:114, July 14, 1938.

Summary

The metabolism of two subjects, who were not in athletic training, has been studied before and after a walk of 10 miles in the post-absorptive state.

One subject, Mills, who lived habitually upon a high carbohydrate diet, showed an inconstant lowering of the R. Q. after the walk, but no ketonuria nor depression of the glucose tolerance, even when he restricted the carbohydrate in his diet.

The other subject, Douglas, who habitually consumed a lower proportion of carbohydrate, always showed a low R. Q. and ketosis after a walk unless he greatly increased the carbohydrate in his diet. His glucose tolerance was considerably depressed after the walk, but if he had been living upon a high carbohydrate diet this depression was absent. The R. Q. after glucose was also determined.

Curves of blood sugar have been plotted for Douglas after intravenous injections of insulin. Those after exercise did not differ from those before in the phase of falling blood sugar, showing that the depressed glucose tolerance was not due to reduced sensitivity to insulin. After exercise there was, however, a delay in the return of the blood sugar to normal, and determinations of respiratory exchange after injection of insulin suggested that this may have been due to a higher level of carbohydrate metabolism at this period. Insulin was found to raise the R. Q. much farther after exercise than before.

The possible bearing of these phenomena upon the regulation of carbohydrate metabolism is discussed.

Book Reviews

CLIMATE AND ACCLIMATIZATION: SOME NOTES AND OBSERVATIONS. By Sir Aldo Castellani, K.C.M.G., D.S.C., M.D., F.R.C.P. (Count of Kisymaio), Professor of Tropical Medicine, Louisiana State University, New Orleans; Professor of Tropical Medicine, Royal University of Rome; Lecturer, London School of Hygiene and Tropical Medicine; formerly Professor of Tropical Medicine, Tulane University, New Orleans; and Ceylon Medical School; Inspector General of the Italian Military and Civil Medical Services during the Ethiopian War (1935-36). *Second edition. Cloth. Price,* 10*s. Pp.* 198, *with* 17 *illustrations. London: John Bale, Sons & Curnow, Ltd.,* 1938.

This little book is not intended for an exhautive work but is merely a collection of notes of the author's personal experiences on long sojourns in many different tropical countries. In the preface he states: "Some minor alterations and additions have been made, but substantially this little book is the same as the first edition." (The first edition was published in November 1930.)

The effects of climate and acclimatization are considered briefly, particularly with reference to the white race in the tropics. The book is based principally on the work of Castellani and Chalmers, and it is useful as a reference book for a brief survey of the author's opinions of the effect of tropical climate.

MASSAGE AND REMEDIAL EXERCISES IN MEDICAL AND SURGICAL CONDITIONS. By Noel M. Tidy, Member of the Chartered Society of Massage and Medical Gymnastics; late Sister-in-Charge of the Massage Department, Princess Mary's Royal Air Force Hospital, Halton. Third edition. Cloth. Price, $5.25. *Pp.* 456, *with* 182 *illustrations. Baltimore: William Wood and Company,* 1937.

This is the third edition of a textbook on massage and remedial exercises designed for those taking the examinations of the Chartered Society of Massage and Medical Gymnastics. The author states that in describing the various treatments she has paid considerably more attention to some subjects than to others, and that her aim has been to provide more details where other books provide a minimum of details. She has done this, for instance, by devoting sixty-five pages to fractures and only thirty-one pages to posture and deformities of the spine. The author believes almost too much information on scoliosis is available in other books and it is impossible even to summarize all the different systems of treatment.

Under each condition the author gives a summary of the etiology, pathology, symptoms and treatment. Under treatment there is a brief consideration of the medical and surgical treatment and a more detailed account of the indicated physical treatment. It can be recommended as an interesting reference book.

ELEMENTS OF CHROMOTHERAPY. THE ADMINISTRATION OF ULTRA-VIOLET, INFRA-RED AND LUMINOUS RAYS THROUGH COLOUR FILTERS. By R. Douglas Howatt, L. R. C. P. (Edin.), L.R.C.S. (Edin.), L.R.F.P.S. (Glas.). With foreword by Sir Henry Gauvain, M.D., M.Chir., F.R.C.S. Cloth. Price, 8/6 d. Pp. 106, with 20 illustrations. London: The Actinic Press, Ltd., 1938.

This book describes the use of the various parts of the visible spectrum in therapy. Chromotherapy is treatment by colored lights. According to the available evidence, red light treatment is simultaneously heat therapy, and it is a question whether a red filter in front of the source of light is an advantage.

In order to prove the value of "cure by colored lights" in the chapter on clinical observations, Howatt gives case histories of twenty-five patients. In this list are hyperchlorhydria, gastritis, duodenitis, anal fissure, pyorrhoea, deafness, chronic otitis media, frontal sinusitis, psoriasis, rheumatoid arthritis, neuritis, eczema and insomnia. There are no control cases and little evidence as to how the diagnosis was made and how recovery was determined. Undoubtedly a psychic element must be taken into consideration in every treatment with colored light. Looking at the above list of diseases benefited one does not wonder that the JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION recently stated: "The commercial possibilities of the use of color as a 'patent medicine' have been appreciated by faddists and quacks for some time."

MANUAL OF THE DISEASES OF THE EYE. By Charles H. May, M.D., Consulting Ophthalmologist to Bellevue, Mt. Sinai and French Hospitals, New York; formerly Chief of Clinic and Instructor in Ophthalmology, Medical Department of Columbia University, and Director of the Eye Service at Bellevue Hospital, New York. Fifteenth Edition. Revised with the assistance of Charles A. Perera, M.D., Instructor in Ophthalmology, College of Physicians and Surgeons, Medical Department of Columbia University, New York. Cloth. Price, $4.00. Pp. 498, with 376 original illustrations including 25 plates, with 78 colored figures. Baltimore: William Wood and Company, 1937.

This book, which is the fifteenth edition of May's *Diseases of the Eye*, has been carefully and thoroughly revised with the assistance of Dr. Charles A. Perera. The authors have improved the text by correcting the chapter on ophthalmoscopy, and the sections on ocular manifestations of general diseases and retinal detachment have been rewritten. A number of new illustrations have been added in the pages dealing with ptosis.

As the authors state in their preface, obsolete matter has been omitted and desirable additions such as dinitrophenol cataract, inclusion blennorrhea, acetyl choline therapy, floaters, gonioscopy, pontocaine and recumbent spectacles, have been incorporated.

Ophthalmology and the whole medical profession owes much to Doctor May for this classical contribution to medical literature. Some idea of his vast influence can be realized when we remember that more than a quarter of a million copies of this text have been printed and sold.

CHRONIC INTESTINAL TOXEMIA AND ITS TREATMENT, WITH SPECIAL REFERENCE TO COLONIC THERAPY. By James W. Wiltsie, A.B., M.D., Consultant in Physical Therapy at the Binghampton City Hospital, Binghampton, New York. Cloth. Price, $3.00. Pp. 268, with 8 illustrations. Baltimore: William Wood & Company, 1938.

Colonic therapy has never enjoyed the endorsement of the majority of the medical profession. It has long been the subject of abuse by quacks and unethical technicians. Yet colonic therapy is being employed by a number of careful clinical observers. The author in his first chapter presents an excellent argument for colonic therapy. He believes that the desirable attitude is not exaggerated abuse by those who do not use it nor overweening praise by those who do but rather a correct estimate of its value and indications.

Doctor Wiltsie's arguments might be more forceful for the medical profession if in his chapter on apparatus he had omitted the descriptions of one apparatus which has been rejected by the Council on Physical Therapy of the American Medical Association and another bearing the name of an osteopath. On the whole this book presents many interesting facts on chronic intestinal toxemia, and anyone using colonic irrigation as a therapeutic measure can read it with interest.

A PRACTICE OF ORTHOPEDIC SURGERY. By T. P. McMurray, M.B., M.Ch., F.R.C.S. (Edin.), Director of Orthopedic Studies and Lecturer in Orthopedic Surgery, Liverpool University; Honorary Orthopedic Surgeon, David Lewis Northern Hospital; Director of Orthopedics, Royal Liverpool Children's Hospital; Consulting Orthopedic Surgeon, Lancashire County Council; Visiting Orthopedic Surgeon, Alder Hey Children's Hospital, Liverpool; Consulting Surgeon to the Ministry of Pensions Hospital, Mossley Hill. Cloth. Price, $5.00. Pp. 471, with 178 illustrations. Baltimore: William Wood & Co., 1937.

This volume gives a description of the basic principles which underlie treatment in orthopedic surgery. The details of many operative procedures usually included in the larger textbooks are omitted. The author describes the types of treatment which have given him the most consistently satisfactory results. Fractures are not considered as McMurray believes this subject is so large that it should have a separate volume.

The following subjects are considered: splints, adhesions and ankylosis, disabilities and injuries of various joints, tuberculous affections of bones and joints, chronic arthritis, epiphyseal affections, deformities and nontuberculous affections of the spine, the foot, poliomyelitis, spastic paralysis, peripheral nerve injuries, affections of muscles and tendons, congenital dislocations and deformities, rickets, general affections of bone and tumors of bone. This volume can be recommended as a succinct textbook of orthopedic surgery.

RECENT ADVANCES IN ORTHOPAEDIC SURGERY. By B. H. Burns, B.A., B.Ch., F.R.C.S., Orthopedic Surgeon to St. George's Hospital; Surgeon to the Belgrave Hospital for Children; Consulting Orthopedic Surgeon to the London County Council, and V. H. Ellis, M.A., B.Ch., F.R.C.S., Orthopedic Surgeon to St. Mary's Hospital, Assistant Surgeon to the Out-patients, Paddington Green Children's Hospital; Consulting Orthopedic Surgeon to the London County Council. Cloth. Price, $5.00. Pp. 296, with 108 illustrations. Philadelphia: P. Blakiston's Son & Co., Inc., 1937.

This volume presents the recent advance in and the present attitude toward orthopedic surgery. The authors state that this book definitely is not intended to be a textbook. The treatment of fractures has been omitted. The authors deserve praise for their accurate work in collecting the views of orthopedic surgeons on the science as well as the art of orthopedics.

THE OCCUPATIONAL TREATMENT OF MENTAL ILLNESS. By John Ivison Russell, M.B., Ch.B., F.R.F.P.S. (Glas.), D.P.M., Medical Superintendent, North Riding Mental Hospital; Visitor, Mental Deficiency Institutions, N.R., Yorkshire; Examiner in Occupation Therapy to the Royal Medicopsychological Association, Examiner to the Association of Occupational Therapists. With foreword by William Rees-Thomas, M.D., B.S., F.R.C.P. (Lond.), Dip. Psych. Med. (Camb.), Senior Medical Commissioner, Board of Control. Cloth. Price, $2.50. Pp. 231, with 41 illustrations by Joseph Blagdon Morgan. Baltimore: William Wood & Company, 1938.

In the preparation of this book Russell primarily has kept in mind the needs of the mental hospital nurse. Doctor Rees-Thomas, in the foreword, states that this is the first book published in England which is wholly devoted to occupational therapy.

Occupational therapy is not a method of cure for mental diseases but without doubt it provides the solution of many problems which arise in these patients. The book is divided into two parts: Part one considers the theoretical side of the subject and discusses the psychological types, the clinical types, the prescription, the organization of an occupational therapy department, habit training, outdoor special classes, ward classes, physical training and recreation, and other chapters on administration. Part two discusses practical work for patients, such as design, woodwork, basketry, brush making, weaving, bookbinding, plastic modeling, plaster casting, concrete work and other occupations.

Russell believes that idleness is a positive evil and that it is the cause rather than the effect of the social, moral and intellectual deterioration of patients suffering from mental illness of long duration. He emphasizes that occupation is as necessary to the patients of a mental hospital as is food and should be administered on a similar standard; that is, agreeable service, of suitable quality and in adequate quantity. This book should be on the library shelves of every mental hospital.

ORTHOPÄDIE UND KINDERLÄHMUNG (ORTHOPEDICS AND INFANTILE PARALYSIS). By Dr. Friedrich Mommsen. Paper. Price, 3.80 marks. Stuttgart: Ferdinand Enke, 1938.

Following the precept of the late Konrad Biesalski to whom the monograph is dedicated, the writer considers the subject of infantile paralysis from its broad "sociobiological" aspect. The goal of treatment is the harmonious reestablishment of the patient in society. At times he is not only compensated for his muscular weakness but actually stimulated to new endeavor by his misfortune. Even if very little reserve power is left it is still the duty of the paralytic to remain a useful member of society.

Faulty posture in bed and the resulting contractures and overstretching of paralyzed muscles must be prevented by the use of splints. When once established, deformity should be corrected by nonoperative means where possible. Gradual correction by Mommsen's famous "Quengel method" is of universal applicability. The part is encased in plaster with a joint at the site of the deformity. Wooden extensions are so incorporated that a loop of string will pull at right angles to the distal part of the cast. By twisting a stick, the string is tightened to take up slack. The infinitesimal movements in bed furnish the corrective force, and the Spanish windlass only holds what has been gained. The extensive application of this method is so completely given in previous publications that only a brief description and two illustrations are included in this monograph.

The significant postures and gaits are considered during the examination. Several are illustrated. Doctor Mommsen is an authority on the mechanics of the various paralytic deformities, but here only the broader aspects are covered. Different from American practice is the use of electrical stimulation in testing the individual muscles.

There is no separate consideration of physical therapy. When the acute stage has passed, exercises and electrical stimulation are started. Contractures are stretched. General instructions are given for the management of a fresh case with a warning against overtiring paralyzed muscles. To eliminate gravity, exercises are performed in the side lie or under water. One must be careful to exercise the weakened muscles and not to be deceived by the contraction of synergists. Children object to electrical stimulation but it is superior for the selection of individual muscles. The response to this stimulation gradually diminishes or disappears in the badly paralyzed muscles.

Even in the extreme cases, early weight bearing is encouraged for the sake of maintaining joint sense and preventing atrophy. The head of the bed is first elevated, with the patient in his splints or on a plaster shell. As the muscles, joints, nerves, and blood vessels again become accustomed to the upright position the patient is allowed to be up even before his muscles have regained their maximum power. The need for braces is determined by the degree of the paralysis. By the use of springs and rubber bands weak muscles are early protected, later replaced, if they fail to recover. Ingenious braces avoid overactivity of weakened muscles while at the same time allowing physiologic exercises of the entire part.

When the change in muscle power becomes stationary, the patient is ready for muscle transplantation (after he is six) or arthrodesis (when he is eight to ten). Foot deformities are corrected by the crushing action of the powerful Schulze osteoclast. The indications and the operative procedures are discussed with emphasis on their effect on the body as a whole.

The monograph is representative of the best work of the German school. The ideas are not all acceptable to Americans but should be assimilated as background for a better understanding of the various solutions of problems involved in infantile paralysis.

YOU CAN SLEEP WELL. THE ABC'S OF RESTFUL SLEEP FOR THE AVERAGE PERSON. By Edmund Jacobson, M.D. Cloth. Price, $2.00. Pp. 269, with 40 illustrations. New York: McGraw-Hill Book Co., Inc., 1938.

The author of "You Must Relax" and "Progressive Relaxation" presents now a book for laymen on sleep. Progressive relaxation, the rest-method developed scientifically, was first presented by Doctor Jacobson in 1908. This method of rest is a method of education having to do with self-control. The author believes that man is provided with the ability to relax.

Failure to slow down sufficiently at night is insomnia. Closely linked to it and often occurring with it are many other ills, including what are commonly called "states of fatigue," forms of "nervousness" and the

"nervous breakdown," but also disorders marked by overactivity in special systems. Jacobson believes if your insomnia results because you are active at night unnecessarily, and if you relinquish these activities, you can sleep well. Definite instructions are given in six concise steps in the use of progressive relaxation to secure restful sleep. The book is recommended to everyone who wants to sleep soundly.

BE GLAD YOU'RE NEUROTIC. By Louis E. Bisch, M. D., Ph. D. Cloth. Price, $2.00. *Pp.* 201. *New York & London: Whittlesey House, McGraw-Hill Book Company, Inc.,* 1936.

The central theme of this book is that as a result of an inferiority there arises a "will to succeed." Psychologists have long recognized the fact that a person's endeavors may be analyzed in a way so as to uncover definite factors which have motivated them. The old story of Demosthenes overcoming a speech defect to the degree that history records him as the greatest orator of all times is an oft-told example of this mechanism. The author emphasizes the fact that it is because of certain physical or psychological shortcomings those so afflicted exert effort so as to accomplish ends which probably they would never achieved had they been perfectly "normal." He therefore implies that it is a blessing in disguise to have a neurosis, provided, of course, compensation and indeed overcompensation occurs. Whether or not neurotic individuals will receive comfort and encouragement from such an attitude is questionable. Pollyanna philosophy has proven helpful to certain types of individuals—so has Christian Science. It is hardly probable that one would prefer being neurotic to being "normal." Nevertheless it is well to look upon a neurosis as an "honorable illness" rather than a shameful malady.

THE BATHS OF BATH IN THE SIXTEENTH AND EARLY SEVENTEENTH CENTURIES. By P. Rowland James, M. A. (Lond.), Associate of King's College. Cloth. Price, 5 *s. Pp.* 176, *with* 6 *illustrations. London: Arrowsmith,* 1938.

This monograph gives a most interesting account of Bath in the Sixteenth Century. Bath in this period apparently was like some of our American spas today. The author states: "The business of bathing, though lengthy, did not occupy the whole of the visitor's time and some who came were not concerned with bathing at all. . . . Lighter entertainment was provided by a bagpipe player and waits, bear-baiting, tumblers, acrobats, and trumpeters."

A visit to Bath in those days was not to be undertaken lightly. Much luggage had to be assembled, for besides personal necessities supplies of various kinds had to be arranged, both for the journey and the residence in Bath. Bedhangings, plate, wood and coal were necessary. Four carts were required by the Earl of Sussex in 1578 to carry his equipment.

In the latter part of the Sixteenth Century the baths of Bath were considered efficacious for diseases "proceeding of a cold and moist cause, as Rheumes, Palsies, Epilepsies, Lethargies, Apoplexies, Cramps, Deafenesse, Forgetfulnesse, Trembling or weaknesse of any member, Aches, and swellings of the ioynts, . . . windie and hydropicke bodies, the paine and swelling of any part of the bodie (so that it proceed not from a hot cause), the sluggish and lumpish heavinesse of body, numnesse of any member, paine in the loynes, the gout, especially the Sciatica, cold tumors of the Milt and Liver, the Yellow Jaundies in a body plethoricke or phlegmatic."

This book is recommended to those interested in the history of physical therapy.

THE MEASUREMENT OF OUTCOMES OF PHYSICAL EDUCATION FOR COLLEGE WOMEN. By Elizabeth Graybeal, Director of Physical Education for Women, State Teachers College, Duluth, Minnesota. Paper. Price, $1.00. *Pp.* 80, *with* 9 *illustrations. Minneapolis: University of Minnesota Press,* 1937.

This monograph develops objective data on the results of physical education in colleges as a substitute for unsupported beliefs concerning the values of required courses in physical education. Doctor Graybeal found substantial improvement from the required physical education courses in attitude toward health and physical activity, in information concerning health and physical activity, in general big-muscle ability and in physical efficiency as measured by the pulse-rate tests. These improvements, while not great in every instance, were demonstrated so consistently by subjects who participated in prescribed courses that a college requirement in physical education would seem to be justifiable. This monograph should be of interest to teachers of physical education.

INTO THIS UNIVERSE: THE STORY OF HUMAN BIRTH. By Alan Frank Guttmacher, Associate in Obstetrics, Johns Hopkins University. Cloth. Price, $2.75. Pp. 366, with 15 illustrations. New York: The Viking Press, 1937.

There rarely appears on the bookstands a treatise on a scientific subject which is presented in so instructive and yet so entertaining a manner as is "Into This Universe." The story of human birth naturally is one about which all are at least curious if not vitally interested, and as presented in the average textbook of obstetrics its technical nature precludes against its availability for the layman. Doctor Guttmacher, in telling his story of "where babies come from," solves the problem admirably. The story reads like fiction and yet contains vital truths which will enlighten anyone who is fortunate enough to have this book available. It is heartily recommended for physician and layman.

PHYSICAL THERAPY, THEORETICAL AND CLINICAL. By Joseph E. G. Waddington, M. D., C. M. (Bennett), with an introduction by Walter J. Turrell, M. A., D. M., B. Ch. (Ozon.), D. M. R. & E. (Cantab.). Cloth. Price, $5.50. Pp. 489, with 274 illustrations. St. Paul: Bruce Publishing Company, 1938.

The Council on Physical Therapy of the American Medical Association has stated that ninety per cent of physical therapy is the use of heat, massage and exercise. As ninety per cent of this book is devoted to electrotherapy it would seem that the title should have been "Electrotherapy."

This monograph is the record of an enthusiast in the use of electrotherapy. The author states: "Only certain diseased conditions and symptoms most commonly encountered are indexed for selective treatment." But under this heading he has listed, starting with abscess and ending with x-ray dermatitis, over one hundred conditions that may be benefited by electrotherapy, colonic irrigations or ultraviolet radiation. The rapid alternating or the rapid faradic current is advocated for artificial respiration; diathermy for diabetes mellitus; "negative galvanism" is the indicated treatment for "Duputren's Contraction;" diathermy and galvanism to the spine are recommended for locomotor ataxia. Many other such statements make it a book that cannot be recommended to the student of electrotherapy as a sound basis for his studies.

THE BIOLOGY OF HUMAN CONFLICT: AN ANATOMY OF BEHAVIOR, INDIVIDUAL AND SOCIAL. By Trigant Burrow, M. D., Ph. D., Scientific Director, The Lifwynn Foundation, New York City. Cloth. Price, $3.50. Pp. 435. New York: The Macmillan Company, 1937.

This book is not for the layman. This is obvious after reading the first page, because very quickly the reader will appreciate that the author is attempting to present something new and extremely complex. Doctor Burrow attempts to explain mental illness as a disturbance of a phylum rather than an individual. In other words problems of adjustment of the group toward a difficult environment are responsible for nervous disorders. The sociologists particularly would find such a treatise extremely interesting. The physician may try to understand what is being written but because of its vagueness, intangibility and hypothetical background and particularly because of its manner of presentation, it is quite likely that after a few pages he will throw his hands up in resignation. However, such is the fate of new concepts. Only the future can be witness to the worth of phyloanalysis.

ARTHRITIS, FIBROSITIS AND GOUT: A HANDBOOK FOR THE GENERAL PRACTITIONER. By Charles W. Buckley, M.D., F.R.C.P., Physician to the Devonshire Royal Hospital for Rheumatic Diseases, Buxton. Cloth. Price, 7 s. 6 d. Pp. 153, with 24 illustrations. London: H. K. Lewis & Co., Ltd., 1938.

This monograph describes the essential clinical features of those disorders commonly grouped together as chronic rheumatism, and the methods of treatment which have proven of service in the experience of the author. It contains a chapter on the classification and nomenclature of the rheumatic diseases; seven chapters on a consideration of rheumatoid arthritis; two on osteoarthritis, and several chapters on chronic villous arthritis, spondylitis, fibrositis and gout.

It is intended as a practical guide for the general practitioner, and as it is brief and practical it can be recommended for this purpose. It is also recommended to physical therapists treating these conditions because it gives an important place to physical methods in the treatment of rheumatoid arthritis, osteoarthritis, fibrositis and gout.

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